IMMUNISATION PROGRAM IN ZAMBIA: REACHING THE HARD TO REACH

DESCRIPTION AND ANALYSIS OF FACTORS AFFECTING IMMUNISATION UTILISATION IN ZAMBIA

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Immunisation program in Zambia: Reaching the hard to reach.
A description and analysis of factors contributing to low immunisation utilization in Zambia

A Thesis submitted in partial fulfillment of the requirement for the degree of Master of Public Health

By
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Declaration:
Where other people's work has been used (either from a printed source, internet or any other source), has been carefully acknowledged and referenced in accordance with the departmental requirements. This thesis "Immunisation Programme in Zambia: Reaching the Hard to Reach" is my own work.

Signature……

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Contents

Acronyms

BCG	Bacille Calmette-Guérin (vaccine against tuberculosis)
CHS	Communications for Health Support
CHWs	Community Health Workers
CIDA	Canadian International Development Agency
CIDRZ/ARK	Centre for Infectious Disease Research of Zambia**/** Absolute Return for Kids.
cMYP	comprehensive multiyear plans for immunization
DFID	Department for International Development- Gov.UK
DTP1	first dose of diphtheria and tetanus toxoid with pertussis vaccine
DTP3	third dose of diphtheria and tetanus toxoid with pertussis vaccine
EPI	Expanded Programme on Immunisation
GAVI	Global Alliance of Vaccine and Immunization.
GIVS	Global Immunization Vision and Strategy
PENTA 3	third dose of hepatitis B, Haemophilus influenzae type B, diptheria, whooping, tetanus
SIAs	Supplementary Immunization Activities
JICA	Japan International Cooperation Agency
MCV	Measles containing vaccine
MOH	Ministry of Health
NHSPHR	National Health Strategic Plan-Human Resource
OPV	Oral Polio Vaccine
PAB	Protection at Birth against tetanus
RED strategy	Reaching Every District
SIDA	Swedish International Development Cooperation
UNICEF	United Nations Children's Fund
USAID HSSP	USAID's Health Services Support Project
USAID	United States Agency for International Development
WHO	World health Organisation
ZISSP	Zambia Integrated Systems Support Project

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"Without the almighty God nothing would have been possible". I will always praise and glorify thy name.

Operational Definition Terms

Reach Every District (RED) Approach- Implemented since 2002, the Reach Every District (RED) approach emerged from the World Health Organization (WHO) and partners in their attempt to devise an innovative strategy to improve stagnating immunisation coverage and effectiveness in Africa.

(Source: WHO 2009).

Missed opportunities

Programme on Immunisation (EPI) recommends that children be vaccinated at every contact with a health facility. Failure to vaccinate a child who attends immunisation or curative clinics with vaccine(s), for which he/she is eligible in the absence of any known contra-indication, constitutes a missed immunisation opportunity. Source: Borus 2004.

Unvaccinated: Children that have not received any vaccine.

Under vaccinated: Children who had received some but not all recommended doses**.**

Fully immunised: For a child to be counted fully immunised he/she should have received the following vaccinations: BCG at birth, first dose of OPV/ DTP-HepB-Hib at 6 weeks of age, the second dose of OPV/ DTP-HepB-Hib at 10 weeks and third dose of OPV/ DTP-HepB-Hib at 14 weeks of age and Measles vaccine at 9 months of age.

Abstract

Background: The Expanded programme on Immunisation (EPI) was introduced in Zambia in 1975, but there are challenges in the utilization of the services as evidenced by disparities in district and national coverage. The proportion of children, who are immunised with DPT3 and measles including those fully immunised, has varied over years. Understanding factors contributing to low coverage is important for the success of the immunisation program. This study examined factors influencing immunisation uptake using the Access to Health Care in the Context of livelihood Insecurity model.

Setting: Zambia, in Southern Africa

Methodology: Literature review of studies and national (Health Management Information system (HMIS)

Results: Zambia's immunisation coverage is facing a downward trend or is static in most districts since 2010. The major factors perceived as barriers were inadequate health services, inadequate trained staff, financial constraints, weak outreach programmes, bad scheduling of immunisation sessions, poor communication, long distance to rural health centers (RHCs), geographical and seasonal challenges and low awareness levels on the importance of taking children for immunisation services among caretakers.

Conclusion and recommendations: In recent years Zambia has faced challenges in sustaining high coverage. However**,** despite all these challenges, Zambia has demonstrated in the previous years that universal access to immunisation and high immunisation coverage is achievable, therefore strengthening existing interventions such as increasing community awareness, increasing political commitment and will, revitalising and intensifying outreach including introduction of mobile immunisation services can assist to achieve this goal. Increased investment to the immunization program in the form of funding, infrastructure, frontline health workers and cold chain equipment is critical to the Zambian situation in order to reverse the current low immunisation coverage trends.

Key words: Immunisations, Sub Saharan Africa, Zambia, Barriers.

Word Count: 11 322

Preface

Introduction

Immunisation is amongst the most cost-effective public health interventions for reducing global child morbidity and mortality (Bloom, 2011). In this decade of vaccines, many early childhood deaths can be prevented by immunising children against preventable diseases. Vaccination reduces the incidence of disease in those immunised but also indirectly protects non vaccinated susceptibles against infection through herd-immunity (Edmunds, 2003).

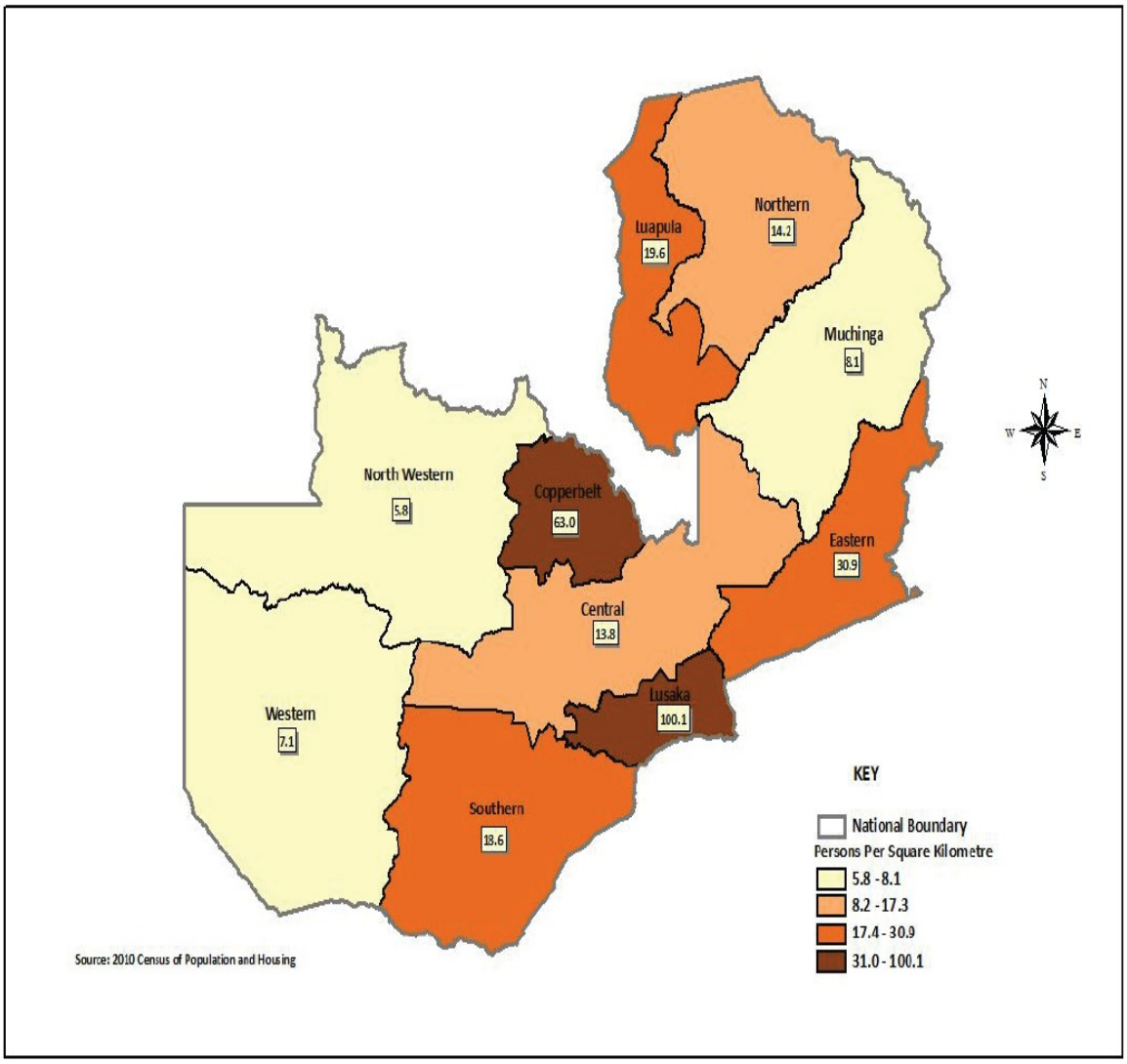
World Health Organisation (WHO) established the Expanded Program on Immunisation (EPI) in 1974 as a public health intervention, targeting the then six childhood killer diseases; tuberculosis, measles, polio, diptheria, tetanus and pertussis (WHO, 2013), with substantial achievements recorded globally culminating into a marked decline in morbidity and mortality. Despite the known benefits of immunisation globally, approximately 22.6 million in 2012 compared to 22.3 million in 2011 did not receive DPT3 vaccine (Ibid). The situation has not been different for Zambia which has seen the increase of unvaccinated children from 133 220 in 2011 to 229 925 in 2012 (MOH 2012).

Zambia adopted the EPI program in 1975, recording several achievements over time, which included the attainment of polio- free status in 2005, Maternal and neonatal tetanus elimination status in 2007 and reduction of measles mortality and cases to near zero (MOH, 2011). However, these successes are threatened with reversal due to the current challenges in achieving or sustaining high routine immunisation coverage particularly during 2010-2012.

I have been working with the national EPI programme since 2008, and noting the negative immunisation coverage trends in most districts coupled with the resurgence of measles outbreak in the country, I decided to focus my thesis on this problem. The general objective of this study is to identify barriers affecting the provision of immunisation services to reach all eligible children at the right time and to recommend strategies to increase immunisation coverage in Zambia. This is important as immunisation is one of the high impact child health interventions adopted by country to reduce child morbidity and mortality and contribute to the attainment of Millennium Development Goal 4 (MDG 4).

Chapter One: Background of Zambia

Figure 1: Zambia's population density and administrative boundaries.



Zambia is located in Sub Saharan Africa, divided administratively into 9 provinces and over 72 districts. The 2010 population count was 13, 046, 508 persons with an annual growth rate of 2.8 percent between 2000 and 2010 (Census, 2010). Overall, the Zambian population is mainly young, comprising of 47% under 15 years and 20 % of the national population is under five years of age (Zambia Demographic Health Survey (ZDHS), 2007). The infant and under five mortality rates are still high, at 70/1000 live births and 119/1000 respectively (ZDHS, 2007). Zambia is a vast country (752,000 km2) and sparsely populated, whose rural areas are remote and difficult to access. The population residing in the rural areas is 7.9 million (60.5 %) while the urban population is 5.1 million (39.5 %), Lusaka has the

highest density with 100.1 persons/km2, lowest recorded in North-Western province at 5.8 persons/km2 (United Nations Population Fund (UNFA), 2013) as displayed in figure 1.

Administrative units

Zambia is a Republic Government whose Capital city is Lusaka. It is administratively divided into 9 provinces; Central, Copperbelt, Eastern, Luapula, Lusaka, Northern, North-Western, Southern and Western and Northern Province. Although figure 1 shows 10 provinces, which includes the newly created Muchinga Province, However, it is still administratively under Northern Province.

Lusaka and Copperbelt provinces are predominantly urban and comprise one third of the country's population while Eastern, Southern and Northern have approximately one-tenth of country's population. Central, Luapula, Western and North Western provinces have 9.72%, 7.35%, 6.76% and 5.41% respectively of the country's population (CSO, 2010). Table 1 shows the names of the 9 provinces and population distribution.

Table 1: Zambia: Population distribution in the province

Province	Population 2010 census	Proportion of total population (%)	EPI target population		
			0-11 months	Pregnant Women	Child Bearing Age Women
			4.9 % of total population	5.4% of total population	22% of total population
Central	1,267,803	9.72	62,122	68,461	278,917
Copperbelt	1,958,623	15.01	95,973	105,766	430,897
Eastern	1,707,731	13.09	83,679	92,217	375,701
Luapula	958,976	7.35	46,990	51,785	210,975
Lusaka	2,198,996	16.86	107,751	118,746	483,779
Northern	1,759,600	13.49	86,220	95,018	387,112
N. Western	706,462	5.41	34,617	38,149	155,422
Southern	1,606,793	12.32	78,733	86,767	353,494
Western	881,524	6.76	43,195	47,602	193,935
Total	13,046,508	100,00	639,279	704,511	2,870,232

Source CSO 2010

Socio Economic Profile

Zambia is considered to be a Lower Middle Income country since 2006 with a GDP of $ 14,441 million and a GDP per capita of $1,358 (UNDP, 2009). Over the past 5 years, the country has registered consistent economic growth, averaging 6.2% growth in the Gross Domestic Product (GDP) per year, and significant improvements in other key macro-economic indicators. However, these achievements have not yet significantly impacted the socio-economic status of the majority of the population (UNDP, 2009) and most Zambians continue to live in poverty and socio-economic deprivation. Poverty levels in the country are still very high, an estimation of 64% of the population lives on less than a dollar per day (CSO, 2010).

The situation is further compounded by the inequities in the distribution of wealth and socioeconomic infrastructure across the country, concentrated more in urban areas, as such adversely impacting on the provision of social services, such as health and education in rural areas (MOH NHSP, 2011), in turn most children born in remote parts of Zambia end up not being vaccinated. These challenges are not peculiar to the rural poor but similar conditions prevail in Zambia's peri urban set ups. These households migrate to cities in search of better opportunities but instead find themselves facing the same challenges left behind in rural areas, as they end up settling in informal un planned settlements.

Health Care Services in Zambia

Zambia's health system is decentralized since 1992 (MOH, 2005).The Health system comprises health posts, health centers, district and provincial hospitals which are directly under the administration of district management teams and provincial medical offices. Ministry of Health headquarters is the final controller of these institutions, whose functions include to provide policy guidance, technical guidelines and technical support to all lower levels. It is also responsible for mobilisation, allocation and disbursement of funds to all provinces and districts. The district medical office's mandate is to implement and monitor health facilities' services in the district (MOH 2011).

The 2010 health facility survey, recorded a total of 1,883 health facilities (HFs) in the whole country (MOH M&E health facility survey 2011), as shown in Table 2. Health facilities in this case include tertiary and secondary hospitals, Health centers, Health posts and private health providers.

Table 2: Health Facilities by province and type - 2010

Province	Tertiary and Secondary Care Hospitals by type			Urban Health Centers (UHCs)	Rural health Centers (RHCs)	Health Posts (HPs)	Total
	Level 3	Level 2	Level 1				
Central	0	2	7	32	113	35	189
Copperbelt	3	9	8	137	53	25	235
Eastern	0	2	8	8	156	53	227
Luapula	0	1	5	1	125	10	142
Lusaka	3	0	15	182	47	32	279
Northern	0	2	6	14	145	49	216
North Western	0	2	10	19	120	16	167
Southern	0	2	14	34	173	31	254
Western	0	1	12	10	127	24	174
National	6	21	85	437	1059	275	1883

Source: Health Facilities' Survey, M&E unit, MOH, Zambia March 2011

Out of 1,883 HFs in the country 79% belong to the public sector, 14% private sector facilities and 7 % church affiliated mission facilities. However, access to health services varies considerably between urban and rural areas: 99% of urban population resides within 5 kilometers of a health facility, compared to 50% of rural households (Poverty Reduction Strategy Paper Zambia 2002).

Zambia's general government health expenditure as a percentage of the general government expenditure in 2011 was 16% (MOH 2011). Government's total expenditure on health as percentage of GDP in the year 2011 stood at 6.1, while general government expenditure on health as a percentage of the total health expenditure was 60% (public) and private 40%.

Zambia Expanded Programme on Immunisation (EPI)

Zambia adopted the immunisation programme in 1975 as one of the key health care package to reduce child hood morbidity and mortality from vaccine preventable diseases (MOH NHSP, 2011), it was initially introduced as a vertical program vaccinating children under one year against six diseases; diptheria, pertusis, tetanus, tuberculosis and measles. Moving towards Universal coverage, universal childhood immunisation was introduced in 1984 introducing immunisations services in all health facilities as an integrated health care package. In 2003, the 'Reaching Every District' (RED) strategy approach a WHO/UNICEF initiative was adopted in order to improve and sustain high immunisation coverage in districts.

In line with the GIVs strategy and WHO set target, the Zambian national immunisation target is set at 90%, while districts should not achieve less than 80% DPT3 coverage. However, the 90% national and 80% districts target applies to all antigens but for reporting purposes DPT3 and measles have been selected as tracer indicators. Districts are encouraged to strive to reach the 90% goal in order for the national to attain its target. However, the minimal goal for districts has been set at 80% acknowledging the challenges currently prevailing in these districts. Secondly it is a requirement by WHO that 90% of the districts should attain 80% or above in DPT3 (WHO/UNICEF 2007). In 2004 tetravalent, DPT-Hib replaced DPT and in 2005 pentavalent DTP-HepB-Hib was introduced into the country's immunization program to replace tetravalent (EPI manual, 2009). The current national vaccination schedule requires children to be fully immunised (FIC) under 1 year of age.

Chapter 2: Problem Statement, Objectives, Methodology and Study Limitations.

2.1 Statement of the problem

High coverage in the country during the 2003 to 2008 period resulted in positive outcomes, such as reduction of both measles cases and mortality, elimination of maternal and neonatal tetanus and attainment of polio free status. In recent years these achievements are threatened with reversal clearly evident by resurgence of measles that was almost wiped out from the face of Zambia. Zambia is among the 10 countries in the Eastern and Southern African region that did not achieve DPT 3 coverage of 90% at national level and at least 80% in every district in line with regional and national goals. Further still, the number of unvaccinated children increased from 133 220 in 2011 to 229 925 in 2012 (MOH 2013, WHO 2013). Prior to the intensification of immunisation activities in Zambia vaccine preventable diseases such as measles and neonatal tetanus, polio were the major causes of vaccine preventable morbidity and mortality. An outbreak of measles in 2010-2011 resulted in 18 115 measles cases and 238 deaths country wide (MOH, 2011).

In order to prevent outbreaks of vaccine preventable diseases Zambia should ensure that the EPI target population is fully immunised so that the country does not slip back into high child morbidity and mortality from such diseases.

Zambia has implemented several interventions over the years in order to achieve universal coverage and capture previously missed opportunities, however, sustaining high coverage has proved a challenge in recent years.

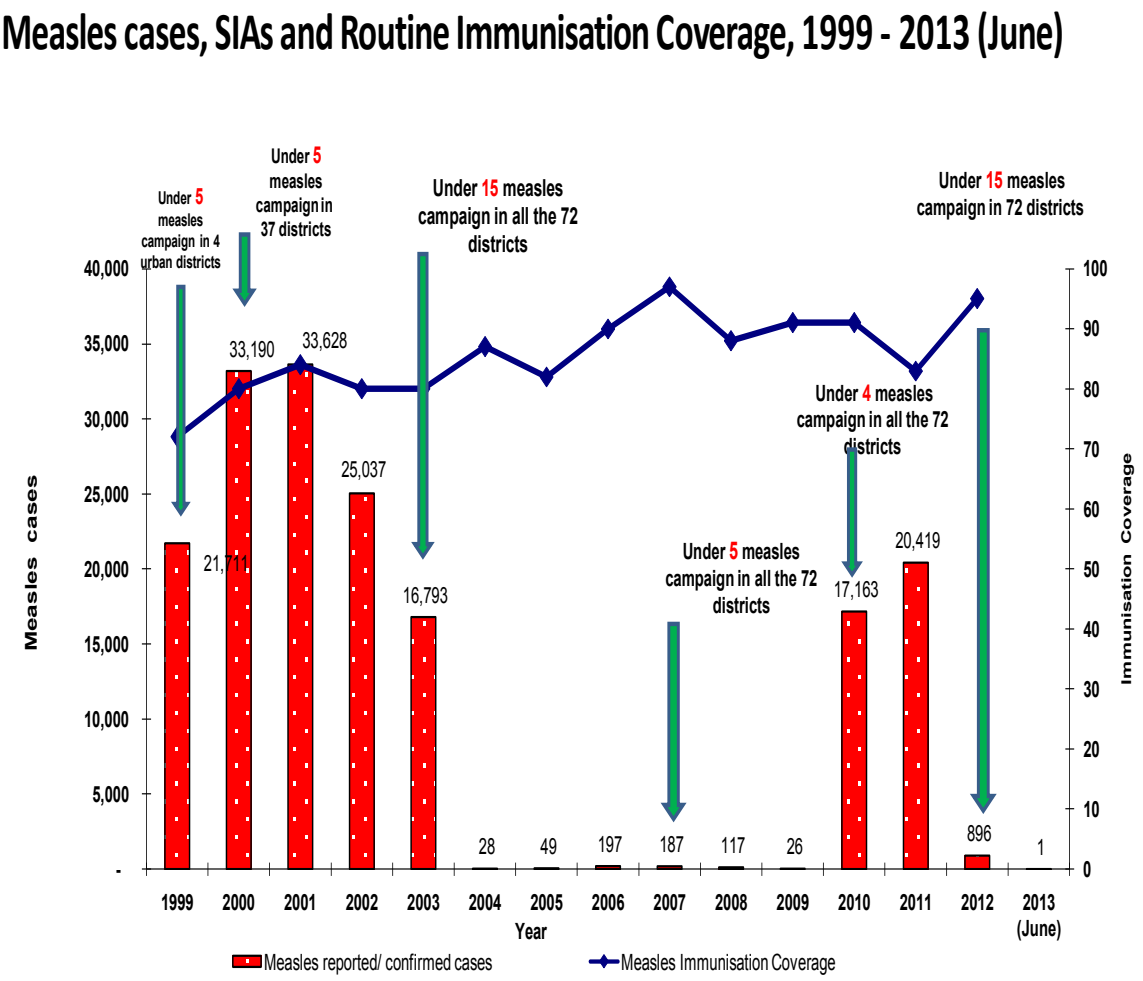
Justification

With the 2015 deadline for the Millennium Development Goals (MDGs) approaching, it is necessary for Zambia to take stock and critically assess its performance and identify key challenges at all levels. The situation requires development of precise strategies to overcome the problems that prevent districts from reaching their targets in immunisation coverage.

Sub-optimal immunisation coverage in districts is a source of concern due to the risk of outbreaks of vaccine preventable diseases but this situation should be investigated and appropriate strategies developed to address any identified bottlenecks. This is necessary to ensure that the available resources are spent on effective interventions and raise immunisation coverage so that children get better health. There is strong correlation between high coverage and control of vaccine preventable diseases as

depicted in the case of measles in Figure 2. It is assumed that when measles vaccinations coverage was high cases almost disappeared, but in the years when coverage declined, measles out breaks resurfaced. Conversely, in the years in which Zambia implemented sub-optimal campaigns in either selected areas or reduced age groups, the country failed to curb measles outbreak.

Figure 2



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Source MOH 2013.

In order to stop the spread of measles the percentage of the population that needs to be vaccinated to effectively stop the spread of the disease is 90-93% (Mc Farlane 2009). Even though vaccination rates are above 80% in Zambia, in principle, less of that population is actually immune. In addition, the efficacy of the measles vaccine is not 100% but only around 95% or less especially in developing countries. This could be the reasons why Zambia is still experiencing big out breaks in the years the coverage hovered around 80% or slightly above as shown in Figure 2. This thesis, therefore seeks to explore factors that may account for the low immunisation performance in Zambia.

General Objective:

To identify barriers affecting the provision of immunisation services reach the EPI target group in Zambia and recommend strategies to increase coverage in the country.

Specific Objectives:

1. To analyse trends in EPI coverage in Zambia from 1984 to 2012.
2. To explore factors affecting immunisation uptake in districts with different performance.
3. To critically discuss the current government strategies implemented in order to increase EPI coverage.
4. To identify best practices and evidence-based interventions from literature that can be implemented to improve coverage and reduce numbers of unvaccinated children.
5. To make recommendations on the basis of findings and conclusions in order to strengthen EPI performance in the country.

Methodology:

The methodology for this study consists of a literature review. Published and grey reports from the Zambian national HMIS and EPI office have been used to analyze immunisation coverage trends in districts. Internet search was done using data bases of PubMed, Google scholar and Scopus to explore determinants of EPI performance. Additional relevant documents were retrieved by visiting websites of WHO, UNICEF, Global Health Initiative Strategy (GHI) and MOH. For peer review articles search terms used were;

EPI, Immunisations, Sub Saharan Africa, Zambia, women, children determinants, barriers and strategies as well as use of such combinations.

Limitations

The study findings on factors were based on literature review and analysis of HMIS data, there was no opportunity for discussion with service providers and communities in Zambia which could have provided a more in depth analysis of country and district specific problems.

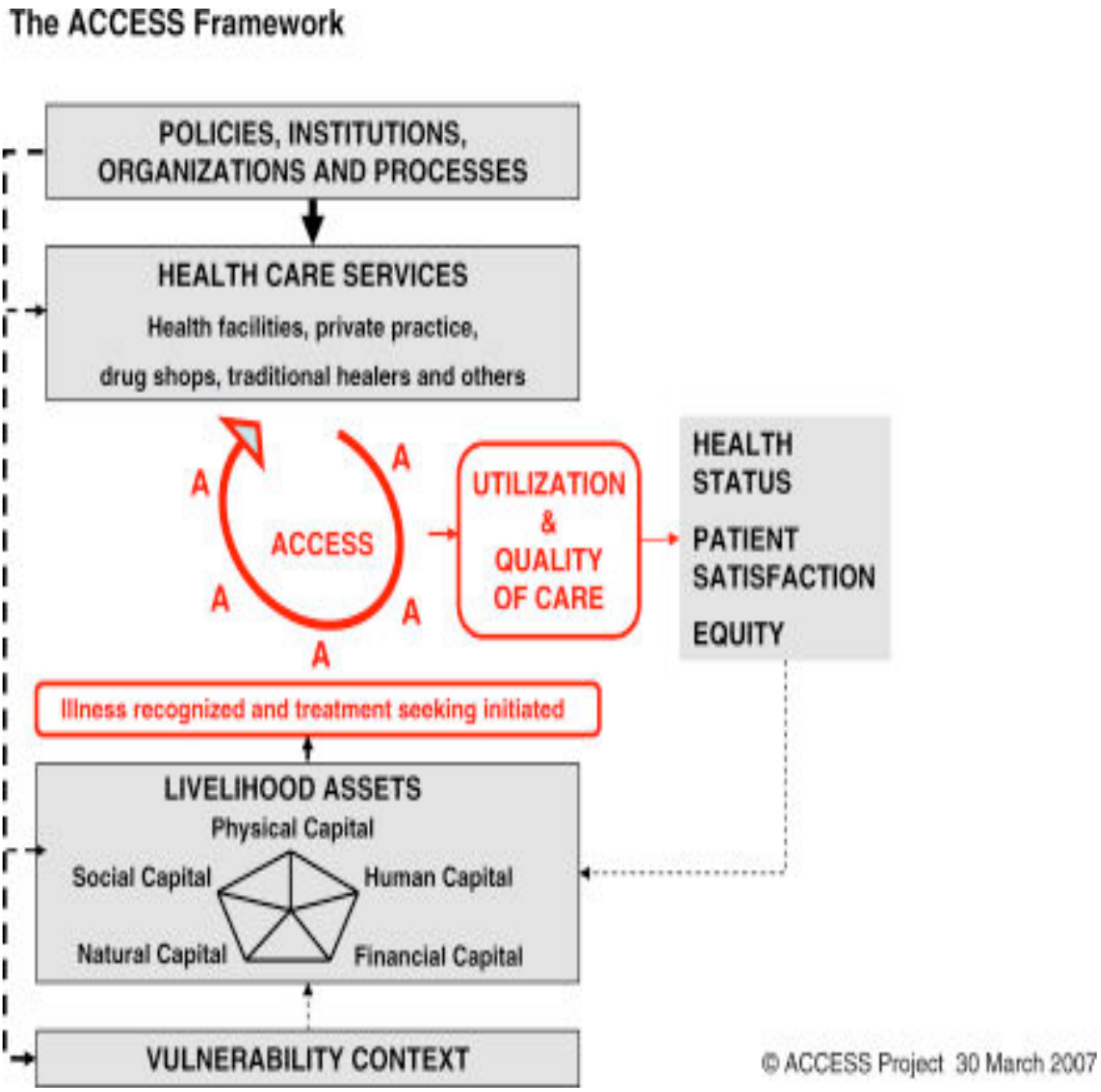
Theoretical frame work

As part of gathering evidence on factors influencing immunization uptake, including issues of inequities in access to health systems: Access to health Care in the context of Livelihood Insecurity frame work by Obrist et al (2007) was used. The frame work was adopted because of its relevance and applicability to this kind of study and was used to guide analysis of factors that influence immunization coverage in Zambia, with special focus on the 5As (Accessibility, Affordability, Adequacy, Availability and Acceptability). It was thought applicable to EPI because the model's major aspects provide the necessary explanation needed to guide the search for barriers sought in this thesis.

According to this model barriers are interdependent and relate to the health seeking process, the nature and organisation of health services and access of livelihood assets (Bakeera et al 2009). It is explained that, in the process of seeking health care, people will use services if they find them acceptable, acceptability of these services is dependent on the nature and organisation of services, in terms of their availability, accessibility, affordability and adequacy (Ibid). The model mentions that Livelihood assets include financial capital, physical capital, natural capital, human capital, and social capital. Financial capital comprises cash and credit whilst physical capital includes the infrastructure, equipment and means of transport. Natural capital refers to land, water and livestock (Obrist et al 2007).

However, since these factors are interdependent and inter linked livelihood assets will be discussed within the five As. Obrist et al 2007, states that the degree of access is reached along the five dimensions depending on the interplay between firstly, health care services and the broader policies, institutions, organizations, and processes that govern the services. Secondly, the livelihood assets people can mobilise in a particular vulnerability context in order to access the services. The model further argues that improved access and health care utilization have to be combined with high quality of care to reach positive outcomes (Obrist et al, 2007).

Figure 3



Source. Obrist et al 2007.

Chapter Three

3.0 Immunisations coverage trends in Zambia

In this chapter, coverage data for four antigens for the period 1984-2012 will be analysed in order to assess performance of the program over the years prior and after the decline in 2010-2012. For the period 2010-2012, data disaggregated by district for the two tracer performance indicators adopted by WHO and UNICEF, namely, DPT 3 and measles will also be analysed to gain a better insight into the heterogeneity within the country.

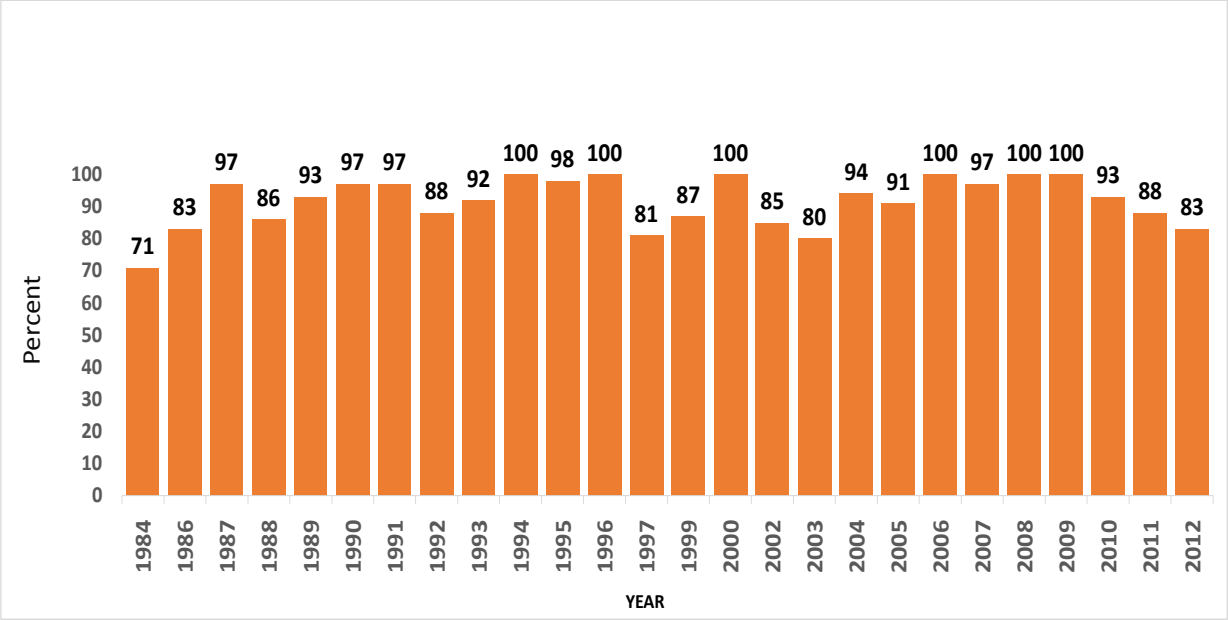
3.1. EPI coverage trends over time

The focus on trends from 1984 to 2012 was to analyse progress over time from the introduction of the different strategies to increase immunisation coverage in the country to date. The year 1984 marked an important milestone in the Zambian immunisation program as that is when immunisations were rolled out to all the health facilities following adoption of the universal childhood immunisation (UCI) concept. Therefore in this thesis, it is the baseline year to track program progress from the time immunisations were scaled up to the whole country. Figure 4 to 7 is showing coverage for BCG, OPV3, (DPT) Penta3 and measles for the years 1984 to 2012.

In 1984, reported coverage for various antigens was as follows, 71% for BCG, 83% for DPT3, 50% for OPV3, and 49% for measles (MOH, 2013). Despite DTP3 and BCG coverage being initially high, coverage for all remained below 80% until the 1990s. Only BCG coverage increased soon after UCI. The possible explanation for the discrepancy between antigens might be that BCG is a single injection that is given at birth so it is easier to obtain and complete in one visit compared to the three series DPT that are given four weeks apart starting at 6 weeks. However, the country recorded low and fluctuating coverage of below 80% until the 1990s when coverage started to improve and reached the peak in 1999 (99%). The assumed factors include the after effects of the economic shock of 1975, recession and the high health workers attrition in the public sector (MOH 2004).

Figure: 4

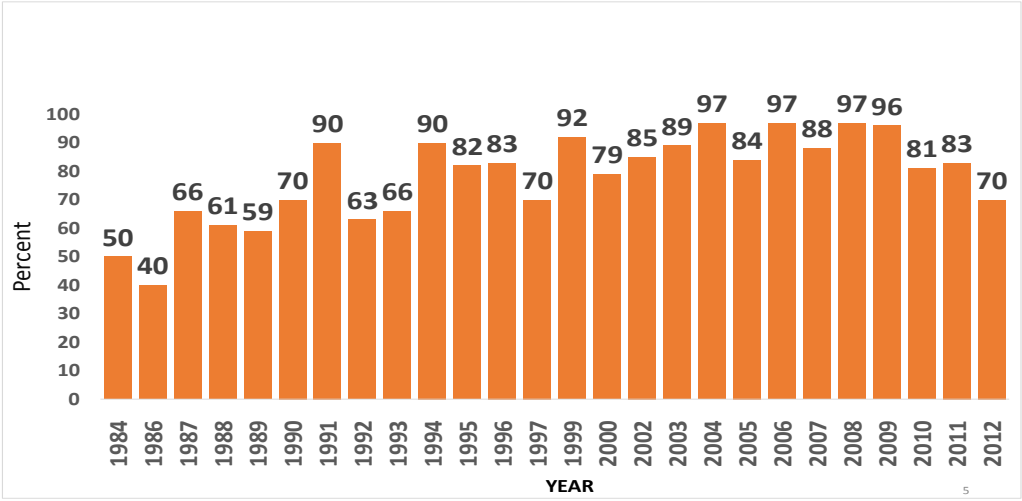
Zambia: BCG routine immunisation coverage, 1984-2012



Source: MOHHMIS 2013

Figure: 5.

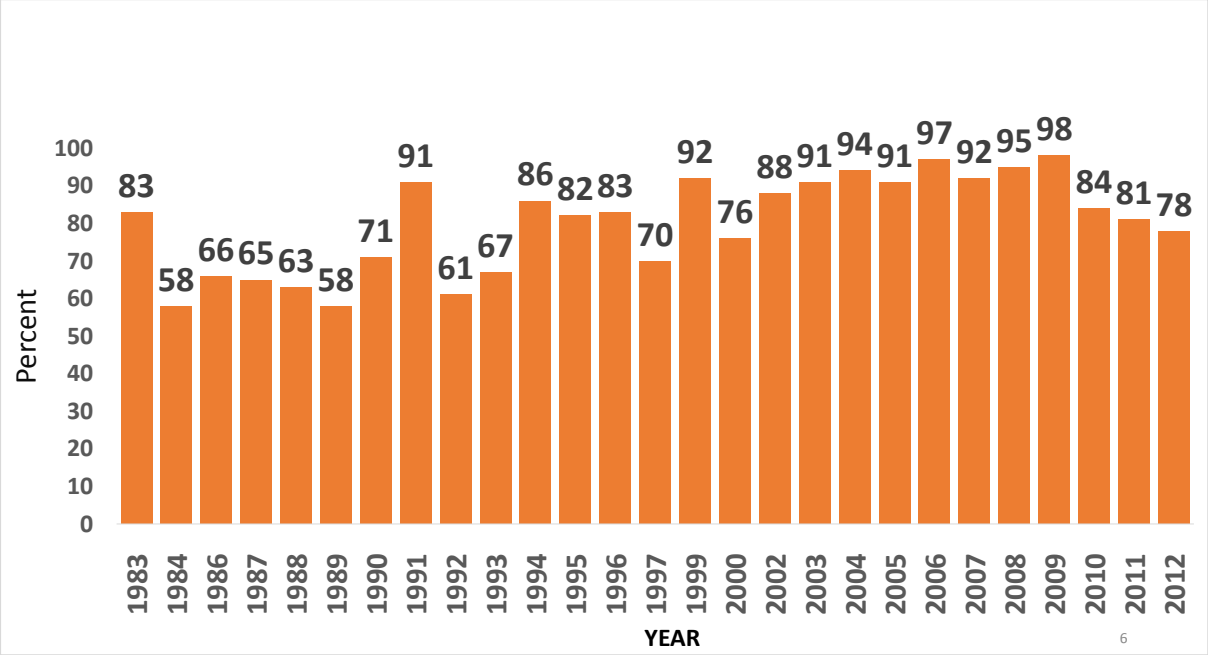
Zambia: Polio 3 Routine immunization coverage 1984-2012



Source MOHHMIS 2013

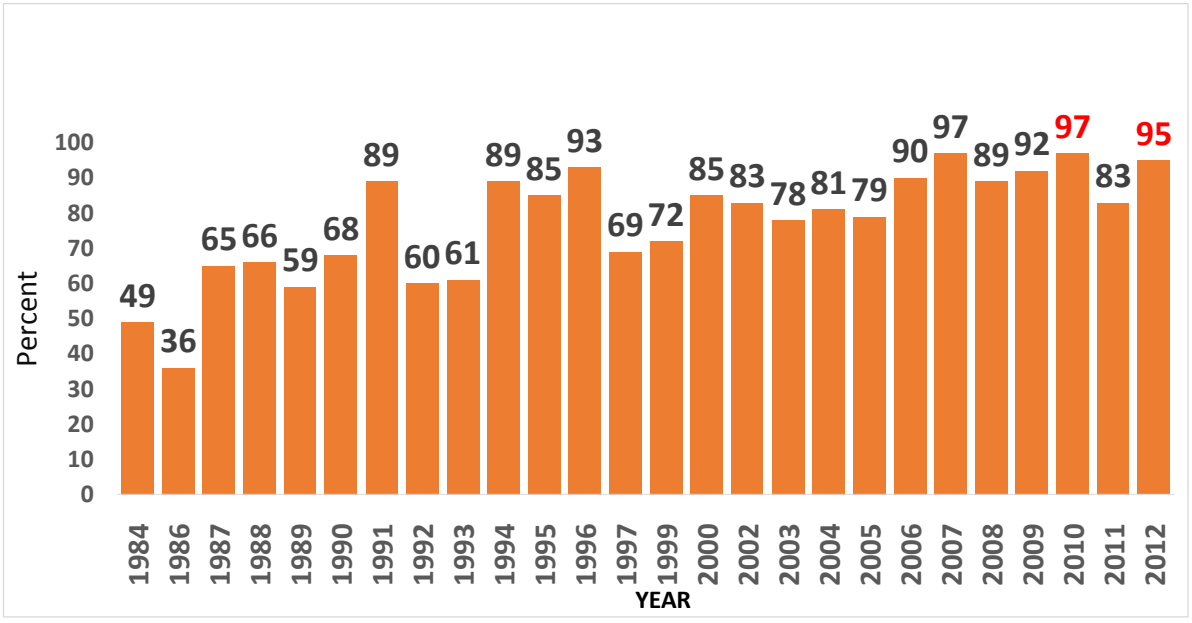
Figure: 6

Zambia: PENTA 3 routine immunisations coverage, 1984-2012



Source: MOHHMIS 2013

Figure: 7 Zambia: Measles Routine immunisation coverage 1984-2012



Note: Percentages in RED: The year(s) of enhanced routine measles immunisation activities and SIAs due to measles outbreak

As demonstrated in the trends in figure 4 to 7 above, coverage increased from the 2000s and peaked around 2003-2007, this is attributed to increased investment to the immunisation programme including funding and innovations from both government and numerous immunisation partners (MOH, 2004). This was at a time when a number of interventions and technologies were introduced to enhance routine performance: introduction of new vaccines (tetravalent and pentavalent), expansion of cold chain, introduction of Reaching Every District/Child strategy with vertical funding, introduction of auto-disable syringes, GAVI financial support to strengthen immunisation services, implementation of Supplemental Immunisation Activities(SIAs) (measles campaign, polio campaigns, child health weeks) and health worker retention schemes.

The country observed a decline in immunisation coverage for all antigens during 2010-2012 except for measles, as illustrated in figs 4-7. However, measles coverage increased steadily during the same period because of the enhanced measles routine immunisation activities in response to the 2010 measles outbreak.

3.2. EPI data disaggregated by district

Figure 8 and 9 below show coverage disaggregated by districts during 2010-2012. The data is an average performance for districts in the three years for DPT3 and measles. Overrall 35 out of the 72 districts recorded below 80% in DPT3 while for measles the number increased further to 44 districts and mainly rural (MOH 2013). Comparing these maps with the data from years prior to 2010 (see annexe 4) the most striking result is that there is a decrease in coverage, even in cities like Lusaka, Livingstone and Kabwe. In other words, whereas before 2010 underperformance was typical for rural areas, in recent years the problem has expanded geographically and also affects urban areas. However, as discussed in the data limitations section (3.2) low coverage rates in urban areas may be an artefact of underreporting of the private sector.

Figure: 8

Zambia: Districts with <80% DPT3 routine immunisation coverage in past 3 years, (2010-2012)

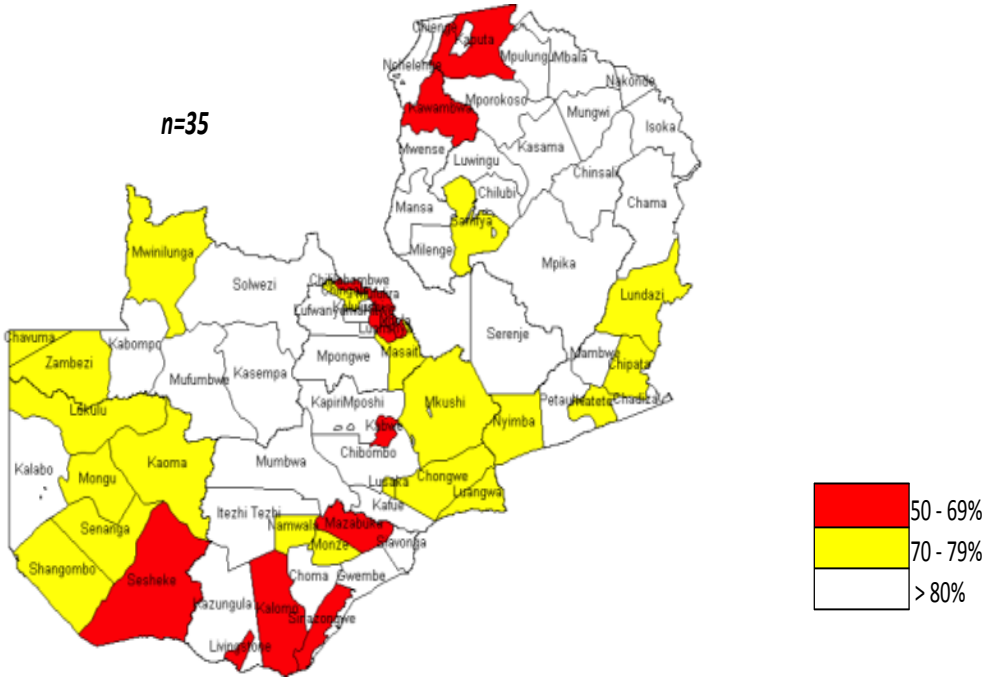
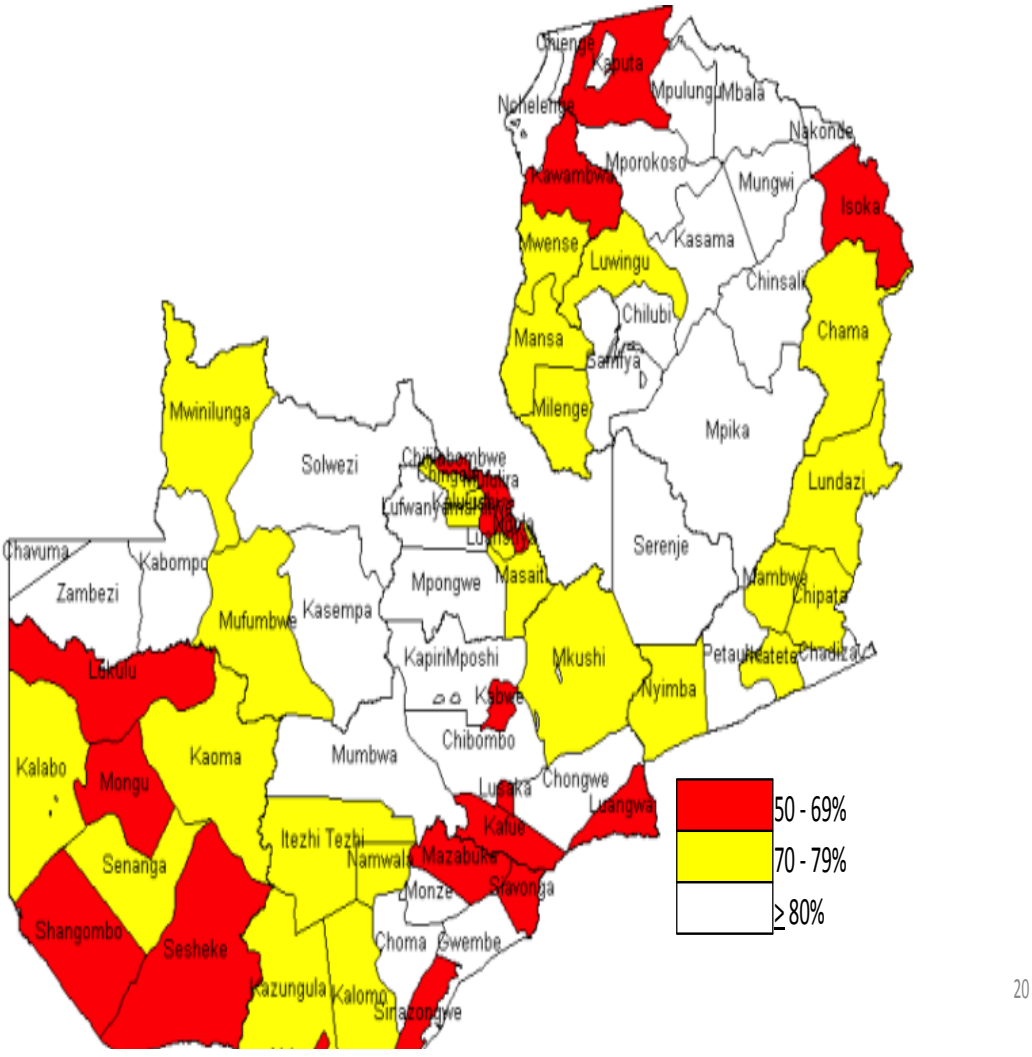


Figure: 9

Zambia: Districts with <80% measles routine immunisation coverage in past 3 years, (2010-2012)



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Source MOHHMIS 2013.

3.2 Limitations of data

There are several limitations with the MOH HMIS immunisation data as explained below:

3.2.1 Private sector contribution

In some of Zambia's big cities, such as Lusaka and Kitwe, significant proportions of vaccinations are performed in the private sector. These are supposed to be reported to the public health authorities but are omitted more often resulting in under reporting of coverage since target population is derived from the total population while the numerator is based only on children receiving vaccination in the public sector (MOH, 2011, MOH, 2012). However, all districts are encouraged to capture data from all health facilities supplied with vaccines. In addition, the EPI team is actively engaging the private sector through the private practitioners association of Zambia and training.

3.2.2 Denominator disparities

Most districts lack precise information on the children in the under- one year cohort resulting in difficulties in estimating true coverage. Overestimation of the cohort will underestimate coverage, while underestimation will inflate the estimate of coverage. In cases where coverage is high and the cohort has been underestimated, coverage estimates exceeds 100 per cent. Systematic errors can also result from failure of health centre staff to ascertain the numerator or the denominator as observed in the post introduction evaluation of pentavalent (PIE) findings of 2009 and data quality audit results in 2012. Other reasons include a mid-year change in target age groups, or inclusion of children from both outside the catchment areas and outside target age group in the numerator.

Districts further attribute over reporting and under reporting to inaccurate denominator figures. The denominator used for official coverage is assigned from Central Statistical Office (CSO) figures and is more often far below the actual numbers in District. It is acknowledged that population census is usually an important source of data on a country's population size, age and sex composition, as well as spatial distribution. However, censuses are susceptible to different types of errors that affect the quality of the data. In Zambia just like elsewhere, the two major errors that affect census data are coverage errors and content errors. Basically coverage errors occur due to omission or duplication of eligible population during census enumeration. A number of reasons account for coverage error such as; incomplete or inaccurate maps or lists of enumeration areas, failure on the part of enumerators to reach all the units in their assigned enumeration areas, double counting, refusals and children born after the reference night (CSO

2010, CSO Lesotho 2006). Coverage errors may result in under- or over-enumeration, and thus affect the population size. While content errors are caused by wrong respondent's response or by enumerators recording wrong responses which distorts the distribution of the population by affected characteristics.

Using the UN interpretation of the accuracy index, Zambia's census office acknowledged that all the three censuses suggest under enumeration of children age groups 0-4 and 5-9 years, although there was some notable improvements in the 2010 census, however, data still fell into the highly inaccurate category (CSO 2012)**.**

3.2.3 Migration (Cross border, cross district)

Other issues include sudden shifts in population as a result of within- district and cross- border migrations.

In order to validate the data Zambia conducted an EPI coverage survey in 2011 and Data Quality audit in 2012 still awaiting final reports. Despite these mentioned challenges, it is the only data source for the EPI program.

Chapter 4: Factors associated with Immunisation Utilisation

This chapter describes the barriers to immunisation coverage at district and health facility level. In this study factors will be analysed using the health access-livelihood frame work adopted from Obrist et al, 2007. The focus will mainly be on the model's five (5As) key dimensions: availability, affordability, accessibility, adequacy and acceptability, while discussion on the following factors: livelihood insecurity, health care services and the broader policies, institutions, organizations that govern services will be integrated within the 5As. The model further points out that factors that determine utilization of health services are interdependent and interlinked.

4.1 Availability

4.1.1 Inadequate facilities

Studies conducted in Zambia identified inadequate infrastructure and inadequate medical equipment including cold chain equipment as one of the major barriers to immunisation uptake (GAVI 2004, MOH 2005, 2010, and MOHNHSP 2011). In addition, health facilities are poorly distributed and skewed towards the urban areas (MOH 2010). Studies conducted elsewhere confirm that inadequate health facilities adversely affect provision of health services including immunisations. The inadequacy is evident in the lack of health facilities country- wide, namely 1882 facilities providing both primary and curative in relation to a population of slightly over 13 million. Studies conducted in Kenya and Malawi cited inadequate health facilities as a barrier to health services including immunisation (Colton 2005, Manzi et al 2005).

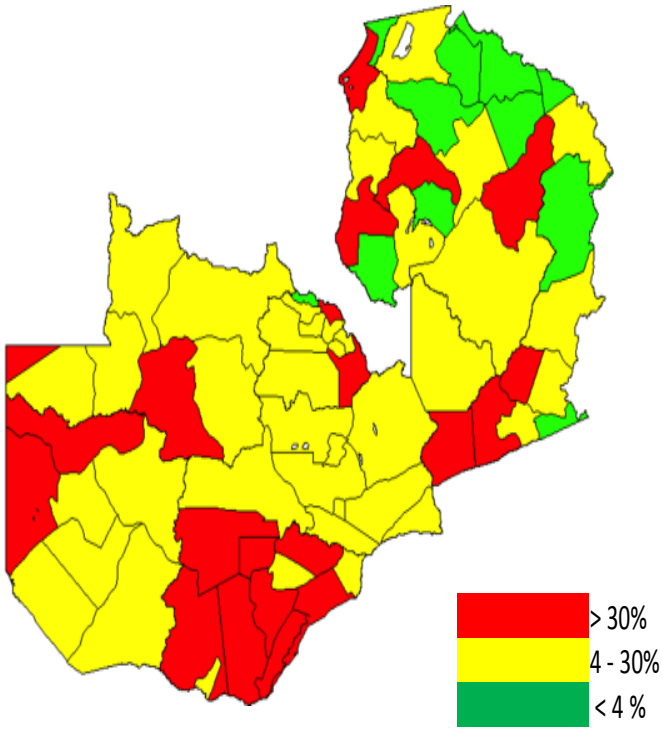
4.1.2 Lack of cold chain equipment

The Constant breaking down of cold chain equipment was one of the obstacles mentioned in studies as affecting the smooth implementation of immunisation session leading to frequent postponement and cancelling of sessions (WHO/AFRO 2007, Moszynski 2010). The 2011 effective vaccine management assessment found that Zambia had inadequate cold chain storage capacity to meet programme need, with a gap of 6,740 Litres. Factors cited for non-functioning cold chain equipment include lack of spare parts and accessories such as solar batteries and difficulties in accessing gas and kerosene including some equipment being obsolete.

District cold chain inventory shows that almost all the districts in the country in 2011 required replacement of cold chain equipment except for 11 districts as depicted in Figure 10 below (MOH HMIS 2011). However the need varied between districts.

Figure: 10

Zambia**:** Districts requiring vaccine fridges to be replaced, as at 2011



22

Source MOH HMIS 2013

4.1.3 Inadequate human resources

In any setting the performance of a health system is largely influenced by the size, distribution, and skill set of its health workforce. Evidence from studies conducted in Zambia reveals huge shortages of health workers (Kombe et al 2005, Makasa 2008, and Walsh 2010). These shortages vary in their intensity by health profession, specialist and location (MOH, 2011). A range of factors drive current shortages of health workforce. The HRH crisis in Zambia is primarily attributed to: death caused by HIV and AIDS; emigration linked to unsatisfactory working conditions and the inability of

government to train and recruit sufficient Health workers (Kachimba & Mwaba 2007 Nikisi et al 2013). In a country study conducted by the World Bank (2009) it was confirmed that Zambia's human resource crisis is so severe such that many Rural Health Centers have no staff or are staffed by untrained personnel while new facilities have been opened without additional staff to run them (World Bank 2009).

Institutional policies and organization of the health systems has a great bearing on the process of the immunisation program in terms of training, deployment of staff and regulation of providers. Considering that Zambia's policy on vaccine administration presently requires trained health workers to give injectable vaccines, unfortunately most districts suffer from a severe shortage of trained staff and are manned by untrained cadres (NHSP HR 2011).

Below table: 3 is showing 2010 staffing and gaps for cadres directly involved with the provision of vaccinations.

Table 3: 2010 Human resource profiles

Cadre	Available	Gap
Nurses	16,732	9,063
Midwives	5,600	2,929
Clinical officers	4,000	2,465
Environmental	1,640	437.

Source: Ministry of health NHSP HR 2011.

[1]The ratios of population served per health staff member being for nurses 1: 1,421 and clinical officers 1:8,583 in the same period (NHRH SP 2011). If immunisation activities have to be conducted effectively and efficiently it is imperative for the Ministry to have adequate and motivated health workers. The low district performance currently is a clear indication of the effect of staff shortages. The Ministry acknowledges that planned interventions within the health sector have not been successfully implemented due to staff shortages (MOH NHSP HR 2011).

[1] Foot note: Gap is based on comparison with establishment which is bases on WHO standards for pop/human resource ratios.

4.1.4 Program funding

Inadequate funding for service delivery was identified as one of the factors hindering the implementation of immunisation activities. Insufficient funding is affecting almost all components and levels including supervision, vaccine distribution, maintenance of cold chain equipment and transport (MOH 2004, GAVI 2004, NHSP 2011, cMYP 2012, Halwindi et al 2013). A number of studies confirmed that insufficient funding had a direct impact on outreach activities leading to low coverage, as that was the only reliable strategy to reach the hard to reach and missed opportunities (GAVI 2004, Wiysonge et al 2012, Van den Ent et al 2011). Table 4 below shows EPI funding profile and gap in funding from 2007 to 2013.

Figure: 4 Immunisation program funding profile 2007-2013.

Source requirement $	2007	2008	2009	2010	2012	2013
Total financing requires $	34,6m	32,4m	33,6m	33,5m	35.2m	52,2m
Total financing secured $	31,1m	21,5m	22,3m	21,9m	30,1m	45,4m
Funding gap $	3,5m	10,9m	11,3m	11,6m	5,1m	10,6m
% Gap	9%	34%	34%	35%	15%	20%

Source cMYP 2012

From the funding profile above there is evidence that there are funding gaps progressing over the years from 2007 (9%), although the worst period is 2008 to 2010 when the gap substantially increased to 34% and 35 %, corresponding with the time of decline in coverage. Factors attributed to inadequate funding include reduced government allocation due to competing health sector priorities and reduced donor funding in response to the MOH financial irregularities during this same period. Outreach services were severely affected during this period as such increasing missed opportunities for the rural communities.

Furthermore, there is still a notable gap for 2012 and 2013. With persistent funding gaps it entails that the immunization program will still continue to face challenges to attain maximum achievements.

4.2 Accessibility

One of the major barriers contributing to low immunisation services in Zambia is lack of access to immunisation services: distance, long travel times to the health facilities, scarce public transport, geographical barriers and lack of means of transport (Halwindi, 2013, Obrist et al 2007.

4.2.1 Distance to Health facilities

Ensuring access to immunisation and other necessary health services is of importance to the improvement of immunisation coverage (Jani et al 2008). Several studies mentioned long distances to health centres as a major barrier to immunisation services and this discouraged parents from taking children for vaccinations (Sasaka 2010, MOH NHSP 2011, Halwindi 2013).

In addition, facilities are inequitably distributed; only 69% of the population lives within 5 kilometers of a health facility, and these facilities are concentrated mostly in urban areas and provinces along the line of rail. 99% of urban population resides within 5 kilometers of a health facility, compared to 50% of rural households (Mukuka et al 2004, MOH 2004, MOH 2010, GHI 2012). In view of this, it is more probable that children who lived close to the health facilities were more likely to complete all their immunisations in relation to those leaving far from facilities (Toiikiliki et al 2009, Dijk et al 2009).

4.2.2 Lack of /irregular Outreach Programmes

Outreach is a proven approach to reach the un-reached and the previously missed opportunities (WHO/UNICEF, 2008). Regular and consistent outreach services are important and essential for communities that are not easily reached both in urban and rural areas. The lack of outreach programmes in Zambia was cited as one of the barriers to immunisation services, especially for the rural areas and peri urban settlements, who in most cases depend on outreach for immunisation services. In a study conducted by Halwindi et al (2013) in Mazabuka district, lack of regular outreach was cited as a contributing factor to reduced utilization of immunisation services. Factors leading to irregular outreach included lack of reliable transport at health centre level. Mazabuka is one such district that reported challenges in conducting outreach and whose 2012 DPT3 coverage was 55%nin 2012 (MOH HMIS 2012). There is a possible association of irregular outreach and low coverage in the district.

4.2.3 Geographical barriers

Geographical barriers are one of the major barriers mentioned in studies for low immunisation uptake especially for rural areas where

the problem is further complicated by the population being sparsely distributed.

Zambia is a vast country and some of its geographical features include mountainous terrain and vast sandy areas, huge stretches of Zambezi plains in the Western province and massive water bodies, worsened by seasonal flooding contribute to hindering access to immunisation uptake (Toikilik et al, 2009, Dijk et al, 2009, Stekelenburg et al, 2004). This results in parts of these areas being cut- off for most parts of the year, one example, being Sesheke and Shangombo district in Western province. The two districts are among the low performing districts in 2012. This problem is further complicated by inappropriate or limited transport. In areas covered with lakes and swamps, the only means of transport is by boat or canoe. Water transport has proved to be more expensive for the districts to sustain within their meager budgets (MOH Supervisory reports). The cost for outreach services such as per diem also increases with the number of days spent to reach these areas. The other factors cited are; poor state of roads, poor transport and communication infrastructure, particularly for rural areas and peri urban areas (Peltzer et al 2006, Skinner et al 2005).

4.3 Affordability

4.3.1 Transport Expenses

Financial constraints is another barrier to immunisation access, most of the Zambians live below poverty line (UNDP 2009) and cannot afford regular transport fees to the health facilities or hire any form of transport at their disposal (Halwindi et al 2013). Although immunisation services are free in Zambia, indirect costs result from transport expenses and food especially in rural settings where women have to walk long distances and spend long hours at the health facility waiting for services. Additional transport expenses are also incurred sometimes because health workers do not show up or fail to open the vaccine vial for fear of wastage in the case of multi doses: BCG(20 doses) or measles(10 doses) (Ibid). The outcome of this postponement automatically means additional costs for these mothers. If a mother does not have transport money they will not come for the first vaccine or if they manage the initial dose, they will most probably not complete the schedule (Jones et al 2005).

Additional barriers include livelihood assets that people can mobilise and combine at a particular time in order to reach the health facilities e. g transport (Obrist et al 2007). As mentioned earlier, most care takers walk long distances to health centers in order to access immunisation services hence livelihood assets such as mobilisation of means of transport and

transport money is important considering the distances that need to be covered to health facilities.

4.3.2 Opportunity costs

Studies cited opportunity costs linked to time as another costs lost by either long waiting on queues or abandonment of income generating activities in order to bring the child for immunisation (Chinkonde et al 2009) and also repetition of visits as required by the vaccination schedule (Rispel et al 2009, MSF 2013).

4.4 Adequacy

4.4.1 Opening hours

Opening hours of service and the amount of time spent at an immunisation post is another significant barrier in both urban and rural communities (Burns & Zimmerman, 2005, Halwindi et al 2013). Factors include inappropriate clinic days and timings coupled with irregular outreach sessions as a result of staff shortage or lack of logistics such as vaccines and fuel or broken down transport. Similar findings in Bangladesh confirmed that cancelling and irregular holding of EPI session, short time spent at posts and inadequate field workers posed as barriers to immunisation service (Jasim, 2009).

In addition, most facilities do not give immunisations in the afternoon while none of them offer immunisation services over weekends and during public holidays. Conforming to week days and stipulated hours has posed a barrier to most care givers especially the working population, business people, male partners and small scale farmers (Babirye et al, 2011).

In order to offer full protection, most vaccines are administered in a number of separate doses, with different vaccines schedules. This multiple vaccination schedule creates a situation where children need to visit a clinic at least five times in their first year of life to ensure full protection (MOH EPI manual 2009). This often proves to be unrealistic for parents and other caregivers, who may be unable to travel with their children so frequently, especially if the clinic is far away. And that means children either don't start or don't complete their full vaccinations (Halwindi 2013, MSF 2012).

4.4.2 Competing priorities

Vaccination session may compete with other livelihood activities such as seasonal field work for farmers, fishing, trading and caterpillar harvesting. In most cases, caretakers forgo immunisation sessions in order to feed. In Gabon competing activities such as farming market days and work made people chose them over taking a healthy child for immunisations (Schwarz

2009). Similarly in Zambia, people migrate to fishing camps, cultivation sites and caterpillar sites (Child health week supervisory reports).

4.5 Acceptability

4.5.1 Inadequate communication and staff attitude

Negative attitude was cited as one of the barriers to immunisation service utilization in Zambia. Reasons cited include a rude and disrespectful attitude by health workers to clients especially those who had lost under-five cards (mukuka et al 2004, Halwindi et al 2013). As such, mothers felt humiliated and discouraged from attending further immunisations sessions: Zimbabwe (Razum 1993), Niger (Keith 1992) Kenya (Abilla 1993), and Bangladesh (Perry, Arifeen, Hossein & Weirbach 1996) (WHO 2009).

The other factor most cited is lack of communication; studies indicated that many mothers were not aware of when to return for the next immunisation dose and expected side effects including what to do about side effects (Zambia EPI coverage survey 2011, Halwindi 2013, Mukuka 2004, Stekelenburg et al 2004). It is evident in literature that recognising illness and/or risk factors and consequent utilization of health services can be influenced by health education (Stekelenburg et al 2004).

CHAPTER 5: Strategies adopted in the country in order to increase immunisation coverage

This chapter discusses the strategies initiated by Government to increase immunisation coverage. Zambia has implemented several strategies in order to increase and sustain high immunisation coverage. However, in recent years coverage is noted to be declining.

5.1 Availability

5.1.1 Adoption of the Universal childhood Immunisation

In order to achieve a wider and universal coverage the government adopted universal childhood immunisation program in 1984 as an integrated basic health care package (EPI manual 2009) making it a requirement for every health centre to include immunisation in their health care service delivery.

Introduction of UCI marked an important chapter in Zambia as immunisations became part of the district primary health care package at the same time introducing vaccinations in all health centers in the country.

5.1.2 Introduction of New vaccines

In order to protect more people from more vaccine preventable diseases, Zambia has continued to introduce new vaccines to the routine schedule. New vaccine introduction also provides an opportunity for improving routine immunisation through training and social mobilization (MOH, 2004). Unfortunately this activity is a one off- thing. However, when new vaccines are added to a weak routine program it increases challenges, including funding as most of the new vaccines are expensive.

5.1.3 Formation of Inter- Agency Coordinating Committee (ICC)

In order to improve collaboration and increase partner support for child health, the Ministry of health formed the Inter-Agency Coordinating Committee (ICC) for Child Health. The committee is chaired by the Minister of Health and attended by heads of agencies of multilateral and other partners. The strategy was designed to benefit EPI and other child health related activities because of the broad representation. The ICC has benefited the immunisation programme in several ways, including lobbing for funding from partners. It is through the ICC that EPI programme managed to solicit for both cold chain and raised funds for measles campaigns.

5.1.4 Financing

Immunisations services are offered free and government pays for the procurement of the routine EPI vaccines: BCG, OPV, HepB, Measles and TT. DPT-HepB-Hib vaccine is co-financed by the Government and GAVI. Further

to this, the Ministry of finance has accorded immunisations a separate budget line through the Ministry of Health. Despite this significant milestone in vaccine procurement, one of the biggest problems faced is for vaccines to reach the end beneficiaries due to inadequate funding of service delivery activities from national to community level.

5.1.5 Health worker recruitment and retention scheme

In a bid to combat shortages of health workers the Ministry of Health developed a human resource strategic plan 2006-2010, 2011-2015 whose main objective is to improve the availability and distribution of qualified health workers in the country through the expansion of training capacity, retention of health workers, improvement of HR management, and implementation of the Community Health Worker Strategy (MOH NHSPHR 2011). However, it has achieved minimal results because of insufficient funding, withdrawal of partner funding, inadequate output from training institutions and civil servants employment freeze including a long restructuring process of the Ministry during the same period.

Zambia's MoH initiated a retention scheme in 2003 with assistance from supporting Partners: Royal Netherlands Embassy, USAID - HSSP, European Union, SIDA, DFID, CIDA (Mwale & Smith 2011) in order to increase staffing for rural areas. The package included increasing salaries and improving conditions for rural health allowances, training opportunities and loans. In return, health workers committed to 3 years of service in rural areas (MOH 2004, Makasa 2008, MOH HNSP-HR, 2011). The success of the retention scheme strategy can be seen in, for instance, eighty-eight doctors completed 3-year contracts and 65 per cent renewals (Gow et al 2011). The only challenge was that it was selective and lacked long term sustainability plan, since it was heavily dependent on donors.

5.1.6 Task shifting (Community Health workers (CHWs))

Zambia has been using community health workers since 80s (Stekelenburg, Kyanamina & Wolffers 2003). Currently, attrition is high because of lack of motivation and competition from the big programs (AIDS programs) that offer incentives.

To mitigate this problem, in 2010, Zambia initiated a new national Community Health Worker Strategy with a plan of training 5,000 new CHWs by 2015 to run health posts (Nava A, Oriana B & Scott L. 2012). The results are yet to be seen.

5.1.7 GAVI support (Immunisation Services Support (ISS) and Health Systems Strengthening(HSS))

Zambia applied for various GAVI support to strengthen the immunisation programme in the following; introduction of new vaccines, immunisation

services support and injection materials and Health systems strengthening. The support has enabled the country to introduce new vaccines; tetravalent (DPT-Hib), penta valent (DPT-Hib-Hepb), pneumococcal and rotavirus vaccines. The introduction of GAVI support has been attributed to the increase in DPT3 coverage from 88% in 2003 to 98% in 2009 (MOH 2010). However, the end of ISS in 2007, 2008, has been linked to the drop in immunisation coverage in recent years (2010-2012) as demonstrated in the trends in chapter three.

Zambia also applied for GAVI HSS for 12 hard to reach districts to address the barriers identified in districts in the Health Sector Wide Barriers for Immunisation (MOH/GAVI HSS 2004). The support included; funding for outreach services, community income generating activities (IGAs), drilling of boreholes, and procurement of transport and communication equipment (GAVI HSS proposal 2007). With this support the immunisation programme has benefited in terms of transport (vehicles, motorbikes, bicycles, boats) for distribution and outreach, while the community benefitted from IGAs and bore holes. The only challenge faced with this support was un-timely completion of the projects due to withholding of GAVI funding during the misappropriation scandal.

5.1.8. Infrastructure and equipment

Government has currently embarked on infrastructure development including construction of health posts as a measure of taking health services closer to the people as possible. But gaps still exist, for example, out of the planned 10,000 health posts only 650 have been constructed.

Cold chain replacement and expansion

As a way of responding to the problem of inadequate and constant breaking down of cold chain equipment, Zambia embarked on cold chain expansion and replacement of obsolete equipment from 2007. With assistance from partners such as WHO, JICA, UNICEF, CIDRZ/ARK, World bank the EPI program has made great strides in bridging the cold chain gap in 2011. However, gaps still remain at health centre level and for the new districts and newly built health centers and posts (EPI cold chain strategic plan 2011). Routine maintenance and procurement of spare parts is another critical challenge.

5.2 Accessibility

5.2.1 Procurement of transport

The study noted that in order to alleviate accessibility problems for the immunisation programme due to lack of transport for logistics and outreach,

the government through GAVI HSS support fund procured transport (2 trucks for vaccine distribution (national level), 12 land cruiser motor vehicles for district offices, 5 speed boats, 100 motor bikes and 300 bicycles for CHWs), to benefit the twelve hard to reach GAVI HSS districts and health centers. However, the only challenge for districts is funding for fuel and routine maintenance.

5.2. 2 Reaching Every District/ Child strategy (RED).

In order to reach the hard- to- reach, Zambia adopted the Reach Every District/Child strategy since 2004. It was initially piloted in ten districts with highest number of unvaccinated children and yielded positive results in the first two years of RED strategy implementation: from 2004–2006, in the 10 pilot districts which recorded increases of 5% to 35% immunisation coverage in all antigens (MOH progress report 2006). In 2008 the RED strategy was rolled out to all the 72 districts. Due to factors such as inadequate funding to the districts, implementation of certain components of the RED strategy (outreach, supervision) is facing several challenges.

5.2.3 Implementation of Supplemental Activities

As a means of reaching the previously missed opportunities, Zambia is conducting bi-annual child health weeks and intensified periodic supplemental activities to complement routine. The results have been positive, for example, the measles campaigns conducted in 2003 and 2007 and 2012 resulted into reduction of measles cases and deaths and increased coverage as shown in the immunisation data in chapter three, while polio and neonatal campaigns have contributed to the country attaining polio free status and maternal and neonatal tetanus elimination status (MOH HMIS, measles reports (2003, 2007, 2012), epidemic reports 2012). However, in recent years implementation of SIAs has been a challenge because of inadequate funding both at national and district level resulting into postponements, reduction in target groups including reduction of provider teams leading to suboptimal results (MOH 2010 measles report).

It has also been observed that most districts reserve funds from their meager budgets in order to conduct these activities at the expense of conducting routine. As such slowly these bi annual child health weeks are replacing routine thereby increasing risks of missing children.

5.3 Affordability

In order to make vaccinations available and affordable for all, the Zambian government provides immunisations free.

5.3.1. Introduction of EPI outreach services and construction of health posts

As a way of taking services close to the communities thereby reducing transport costs for people, districts are requested to institutionalize outreach as an essential EPI package. Outreach costs are supposed to be part of their major activities in the yearly action plans. In order to have a health post within five kilometer radius, Zambia has embarked on the construction of health infrastructure including health posts to shorten distances and reduce transport expenses for the communities (MOH 2011, MoF 2011).

5.4 Adequacy

As a way of improving and making services adequate, the EPI policy in Zambia encourages health centers to offer immunisation to mothers any time during clinic operating hours (supper market). However due to inadequate staffing and competing priorities this has not been possible. Routine immunisation services have been complemented with bi annual child health week days, Africa immunisation weeks, supplemental immunisation campaigns and periodic mop up activities (SIAs) (EPI manual 2009).

5.5 Acceptability

In order to increase public awareness, the Ministry of health with assistance from cooperating partners (ZISSP, UNICEF, WHO, CHS) uses different media channels to disseminate information on immunisation especially during child health week and campaign activities and periodically for routine.

In order to improve skills for the service providers, the Ministry of health conducts mid- level management training for district managers and tutors for nursing schools including the institutionalization of immunisations as part of the curriculum for pre-service nursing schools. In addition, the EPI programme conducts periodic RED strategy training programmes for health centers and community members (MERCK vaccine Zambia 2011). Training has not been without challenges. Before being rescued by MERCK vaccine Zambia, training in 2009, the EPI program had last conducted mid level management training for district managers in 2004. This caused skill lapses in immunisation management skills especially for new district managers.

Chapter 6: Strategies to improve EPI coverage: Examples of Best Practices

In this study, a number of best practices were identified that can be replicated or strengthened. The search for information was focused on strategies that have been tried and those currently being implemented in Zambia but seem not to yield maximum results and yet same strategies are working well in other countries or areas. Zambia has initiated and implemented a lot of recommended strategies but has not achieved the intended results. In order to improve coverage they might need revitalization and more commitment hence learning lessons from other countries that are doing better in those strategies will provide valuable contribution to the improvement of the programme performance.

6.1 Availability

6.1.1 Involvement of private providers

Currently, in Zambia there is an increase in private sector providing immunisation especially in urban areas; similarly this practice can be extended to rural areas by contracting them. In Cambodia, nine rural districts increased access and immunisation coverage in districts serviced by NGO contractors than in districts using government services (Schwart & Bushan 2004). In Bangladesh and Cambodia, it was noted that contracting out improved access to services for the targeted poor (Liu et al 2004, Levin & Kaddar 2011).

Use of Performance based financing to improve coverage. In Cambodia coverage increase in pilot districts were attributed to performance based funding (Soeung et al 2006).

6.1.2 Improving staffing

The current retention scheme should continue but with government ownership rather than relying solely on donor support. The government can request partners to second staff in hard to reach areas at the same time work towards absorbing them on government pay roll. Evidence has shown that several countries in the region have used different mechanisms of incentives to motivate and retain staff. In a literature review conducted by Dambisya in 2007 for 16 countries in east and southern Africa, it was illustrated that both monetary and non monetary incentives were used as retention schemes. Incentives included training and career path-related incentives e.g continuing professional development, opportunities for higher training, scholarships/bursaries and bonding agreements and research opportunities. In the same review it was noted that other countries

introduced incentives that addressed social needs like: housing in Lesotho, Mozambique, Malawi and Tanzania; staff transport in Lesotho, Malawi; childcare facilities in Swaziland; free food in Mozambique and Mauritius; and employee support centres in Lesotho (Dambisya 2007), while Zimbabwe paid a monthly tax-free salary top-up to health workers, depending on grade and site (Dieleman, Watson & Sisimayi 2012).These are some of the options that Zambia can adopt to improve on her current retention scheme.

6.1.3 Task shifting

Currently Zambia is utilizing lay community health workers to assist health workers at health centre level in a number of activities including defaulter tracing and social mobilization, but face challenges of high attrition due to lack of incentives. Other countries have used community health workers to bridge the health worker crisis. India and Pakistan provide a good example: community health workers are used to cushion human resource crisis in rural areas and assist in vaccinations (Patel et al 2009, Cockcroft et al 2009). As a motivation they can be appreciated both monetary incentive and non monetary incentives such as recognition, training and bicycles.

6.1. 4 Improving program financing through pooling of resources and integration

Financing of the immunisation program has a huge impact on the immunization service; lack of regular or adequate funding is a commonly cited reason for failure to implement outreach activities in districts in Zambia. Similarly, in a cost and financing assessment for Ethiopia's National Immunisation Program found that operational costs (primarily transport and per diem payments) for integrated outreach were consistently underfunded or not funded at all (Stevenson, Candries 2002). In order to alleviate this challenge, pooling of transport and resources was used from donor funded vertical health programs (eg, reproductive health, integrated management of childhood illness, malaria and tuberculosis control) (Ibid).

In Vietnam, better-funded malaria control programs have "hosted" immunisation, vitamin A distribution, and deworming outreach sessions (UNICEF/WHO 2004). In Zambia, the cervical cancer screening program supported by CIDRZ and PEPFAR is supporting the pilot introduction of HPV and Rotavirus vaccines in three districts (MOH/CIDRZ 2012).

Through strong advocacy, Ethiopia managed to secure support from a partnership creation between Afar Regional Health Bureau, WHO and World Vision Ethiopia to support EPI activities in the region. In addition, World Vision Ethiopia Afar branch donated $58,000, 6 kerosene refrigerators and 80, 000 capsules of vitamin A for Afar region (WHO, 2013)

6.2 Accessibility

Outreach is one of the strategies recommended by WHO to reach the unreached and to also increase and improve immunisation coverage (WHO/AFRO 2007). For example, in Kenya, USAID supported outreach project increased immunization coverage in Busia district from 40% to 60%, Teso district from 45% to 78% and Somia district from 56% to 77% (USAID, 2010). Similarly, in Pakistan outreach teams and community health worker conducted outreach in remote areas which resulted in an increase of 20% measles coverage (Cockcroft et al, 2009). In Nigeria, access to immunisation services was improved by increasing the number of locations offering immunisations and adding mobile clinics in the evenings, an increase was observed in the intervention area for full Vaccination coverage from 5% to 43% over a two-year period from 1984–1986 (Ryman, Dietz and Cairns 2008)

6.3 Acceptability

Community volunteers can be engaged for mobilization and the tracking of women and children and to assist health workers to conduct outreach sessions. In Cambodia, volunteer support for integrated health outreach services was a major contributor to increased coverage (Fronczak , Meinke & Rogosch 2007). During this project two volunteers were selected per village to helped raise awareness by providing health education and mobilizing communities.

In Indonesia, since 1985, the integrated outreach program (integrated health post), is managed by volunteer married women. These integrated health posts offer the following activities: basic health services of nutrition, maternal and child health, family planning, immunisation, and prevention of diarrhea. The use of volunteers was linked to lowering fertility and improving child survival (Partapuri, Steinglass & Sequeira 2012).

Advocacy through Community Leadership

Active participation by community leaders is cited as a significant factor for motivating communities to attend integrated outreach sessions. An example can be drawn from Cambodia, were community leaders were used to notify the village households and to refer the mothers and their children to scheduled outreach sessions (Crespo, Kolesar, Ram, et al 2008).

In Madarounfa , Niger, in 2003, with Canadian funding for accelerated child survival and development programme (ACSD), 240 tribal chiefs were provided with detailed information on the importance of childhood vaccinations, and briefed on vaccination coverage among children in their communities and were urged to conduct social mobilization activities. As a result coverage in the district DTP3 increased from 42% in 2002 to 103% 2004 while measles increased from 53% to 95% respectively (UNICEF, 2005).

6.4 Adequacy

Lack of sufficient skills in immunisation service delivery by both frontline workers and district management is one of the reasons cited for low immunization coverage resulting from high staff turnover due to high attrition, restructuring and new graduates from training institutions (Zambia Merck Vaccine Needs assessment 2009). Training and frequent supportive supervision has proved to be a challenge for the EPI program because of the inadequate resources.

Lessons can be learnt from the CARE/India's Reproductive and Child Health, Nutrition, and HIV/AIDS (RACHNA) programme in India, using existing platforms for capacity building of frontline workers, such as monthly workers' meeting to provide training on immunisations (Partapuri, Steinglass & Sequeira 2012). In addition, job aids were provided and regular analysis of monthly program performance in monthly review meetings. This contributed to increase in the proportion of children who were fully immunisation by 16% in 5 years (CARE India; 2008). Zambia can try to explore and adopt this strategy as it is feasible.

Peer pairing

Peer pairing is another strategy that was employed to improve coverage. In Indonesia, experienced nurses in well-performing health centers trained other nurses in poorly-performing health centers (1993–1994). This intervention proved to be both cost effective and contributed to increase in measles coverage by 25% in intervention health centres (Partapuri, Steinglass & Sequeira 2012). Zambia can replicate this as a way of offering on site trainings.

Chapter 7: Discussion, conclusion and recommendations.

Despite the known benefits of immunisation in terms of its cost effectiveness and reduction in infant and child mortality and morbidity, 22% (222 925) of Zambia's children remain unvaccinated in DPT3 in 2012 as described in Chapter 2. Such situations are unacceptable because vaccines are readily available in the country.

It is evident that Zambia is currently facing challenges in reaching hard to reach areas and sustaining high immunisation coverage especially in the past three years (2010-2012). Some districts are continuously low performing and several possible causes were identified in the thesis as noted in Chapter 4. The major factors were related to the five As (Availability, Accessibility, Affordability, Acceptability and Adequacy) at the same time linked to the broader health care policies. However, despite all the factors having specific barriers the thesis concluded that the major barriers are related to Availability, Accessibility and Adequacy. At the same time it was noted that many of the strategies identified to address one of the barriers can actually address other barriers, in that, in most cases they are interdependent and interlinked as mentioned in the Access model. This is why the country should identify and implement evidence based strategies that will assist to address multiple barriers. Below are the main highlights of the identified program barriers and some strategies identified to address them, as well as a discussion on data limitations.

Discussion

7.1 Data limitations

The thesis identified challenges with the present administrative data. The prevailing situation of some districts reporting coverage of above a 100% raises concerns for the program as it is not possible for a country like Zambia with the identified challenges and high numbers of unvaccinated children to capture 100%. These un realistic high figures give a false picture and can lead to a feeling of complacence in facilities and districts reporting these high figures while in actual fact they are not capturing their entire target. On the other hand, for the districts that report low coverage, it is always difficult to come out with definitive conclusion as data might also be an artifact. The unrealistic low figures can also de- motivate health workers. Data quality is one of the critical components that should be addressed

urgently in order to resolve issues of over reporting (100% and above) as noted in chapter 3. The validity and reliability of such data is questionable and poses challenges for the program to gauge its actual performance. Since data discrepancy seems to be a long standing issue as acknowledged by CSO and noted in the 2011 EPI coverage survey and 2012 data quality audit assessments (MOH 2012), it is important for the country to conduct head counts, regular surveys and frequent facility data audits in order to validate the HMIS administrative data. Nonetheless, there are still districts that have been perpetually recording low coverage and have become even worse in the recent years. Many studies conducted in the country and elsewhere attribute the performance to the five 'As' agreeing with the findings in this study. However, after analyzing the factors, this study concluded that district low performance could be attributed mainly to availability, accessibility and adequacy.

7.2 Availability

7.2.1 Inadequate infrastructure

The thesis identified four major barriers related to availability of services mainly inadequate infrastructure, inadequate human resource, lack of/obsolete cold chain equipment and insufficient program funding. It was noted that these are not newly emerging issues but currently have been exacerbated by rapid population growth which is not matching investment in infrastructure. Government has failed to keep pace with Zambia's population boom. As a result of this rapid population growth, Zambia has continued to have a very young population and 60.5% of the population is in rural areas (CSO 2010). This poses a great challenge to the country in terms of provision of social services such as health services. The challenge of infrastructure is worse in rural areas and unfortunately that's where 60% of the population resides. This could be a possible explanation for low coverage in rural areas because most of the populations lack access to health services. Similar trends of low coverage and consequent accumulation of high numbers of unvaccinated children is becoming a common feature in urban areas, the most possible explanation is that Zambia is one of the countries in Sub Saharan Africa urbanizing at a fast rate as people are migrating to urban areas in search of jobs and better life. According to 2010 census findings urban population increased from 34.7 percent in 2000 to 39.5 percent in 2010 (CSO 2010). Most of these migrants end up in slums with no health infrastructure since they are regarded as unplanned settlements. The vicious cycle of poverty continues and children born in these areas face similar challenges to those they left behind in rural areas in spite of the assumption that health facilities and personnel are more concentrated in

urban areas. However, because of the current national challenges urban growth is occurring in large cities that are already struggling to meet the basic needs of their populations which include insufficient staff and facilities to meet the demand of the large number of clients.

Although Zambia has embarked on a program to build health facilities, infrastructure developments are expensive and long term projects which cannot match with the pace of the current population growth. For example, out of the 10,000 planned health posts country wide only 650 have been built in the last three years. It is therefore critical for the government to mobilise resources even from partners for infrastructure development in order to improve coverage of health services including immunisation.

The review also noted that lack of/ constant breaking down of cold chain equipment was another reason found to negatively affect immunisation uptake. A closer analysis of coverage in chapter 3 on DPT3 and Measles for 2010-2012 suggests that districts that needed more than 30% replacement of fridges also reported low coverage (Mufulira 73%, Kalomo 41%, Sinazongwe 36%) see district specific coverage in the annex. However, from 2003 to 2007 JICA had assisted the government to replace cold chain equipment. Nonetheless gaps still exists in newly built health facilities while in other health centers the equipment is obsolete and need replacement. Cold chain is the back bone of immunisation and its absence means no storage place for vaccines which may lead to missed opportunities. There is need for the government to find a lasting solution in sustaining maintenance and procurement of cold chain equipment, in order for the children to get potent vaccines, by increasing funding allocation for cold chain equipment. Secondly, additional funding can be sourced from partners through lobbying from partners to complement government efforts. Otherwise vaccines will not reach the areas with no fridge or non functional fridges thus disadvantaging the children in those communities.

7.2.2 Inadequate funding

Inadequate funding to immunisation program activities was one of the major factors affecting maximum program performance. It affects almost all levels and cripples implementation of main activities such as outreach, maintenance of cold chain and transport both for outreach and distribution. However, the government should be commended for their efforts in allocating a separate budget line for vaccine procurement, but the gap is on how to get these vaccines to the target population. During the period when the program received increased resources between 2003 to 2007 performances was good. The high coverage was attributed to this increase in resources of support immunisation activities (MOH 2009). However, most of the support was donor funded hence with the withholding of funding during

the 2008 to 2010, most activities were disrupted. This could be one of the reasons for the fall in coverage as the country is still experiencing the after effects of withholding of donor funding. In view of this it is important for the government to increase support to the health sector in order to reduce the current donor dependency. It is also worthy to note that funding for most of the immunisation programs is donor dependant including part of vaccine procurement which is co-financed by GAVI. However, the country was fortunate because donor freeze did not affect vaccine procurement. It implies that implementation is dependent on the good will of donors and withdrawal of funding will negatively impact on program activities as was the experience prior to 2010.

7.2.3 Human resource

In addition to being inadequate, Zambian health workers lack motivation because of low salaries and allowances. Zambia can still increase coverage by motivating the available health workers through incentives such as the current retention schemes and scaling up result- based financing from the 9 districts, so that part of the support and benefits goes towards motivation of health workers. Zambia can increase availability of trained staff through increase in training; by increasing numbers in existing nursing schools, and consider re- introduction of the two year certified nurse training which was currently stopped. Involvement of the private sector in both training and provision of services can assist in alleviating the human resource crisis. Countries facing similar problems of scarce trained human resource have turned to using paid community health assistants. Studies have shown that hard to reach populations can be reached by investing in community health worker programmes to address maternal, newborn, and child health (GHWA 2010). Experiences from Malawi's Health Surveillance Assistants (HSAs) and Ethiopia's Health Extension Programme (HEP) paid cadre, has shown to have improved access to health services in rural areas (Mathieson &Brearley 2012, Amber et al 2013). However, success of the program anchors on health system pillars such as training, support for incentives for community health workers, strengthening of the supply chain, simplified tools and information systems, monitoring and regular feedback in order to improve performance and the ability to sustain allowances.

In 2011, Zambia embarked on restructuring of ministries in a bid to improve performance, the current realignment and restructuring processes are adding to disruption of services. Although the intention is good, the implementation process has resulted in disruption of services at all levels emanating from current uncertainties surrounding the implementation of this

alignment especially at provincial and district level. Previous restructuring only ended in 2008 and when staff were getting settled its now re-alignment process. However, the advantages for the immunization program are clear in that they can utilize the already established structures in MCDMCH to reach communities. Nonetheless, government should speed up processes as further delays will result in more children not being vaccinated.

7.3 Accessibility

Access to health care is a major public health and development issue. Even the most powerful diagnostic tests, drugs, and vaccines have little public health impact if they do not reach the people that need them the most (Gillespie & Packard 2003). Accessibility problems are as a result of several factors such as long distance; long travel times to the health facilities, scarce public transport and lack of means of transport in rural areas, difficult terrain and seasonal barriers. These problems will continue as long as the population keeps growing and people end up settling farther away from health facilities, as the current situation stands, there is an increase in the population but no meaningful increase in health infrastructure especially in rural areas and peri urban areas. Hence the problem of distance is perpetuated. In order to increase access to the hard to reach areas and reduce on distance, both the government and districts should strengthen outreach programmes by ensuring that transport and vaccine logistics are always available for these programmes and increasing the number of outreach posts where need be (Hendryx et al 2003). Interventions that are implemented at community level such as outreach have proved to be the most effective way of reaching the poor segments of the population (WHO 2007). With the problem of infrastructure, the only way to reach the population is through outreach.

7.4 Adequacy

7.4.1 Opening hours and time.

Although government policy stipulates that all health facilities should offer immunisation services to encourage utilization, not all health facilities offer these services on a daily basis and opening hours were noted as barriers in that they are not convenient to cater for the needs of everyone in the community (e.g working mothers, fathers, marketers and farmers). This can be one of the other factors attributing to the shift of low coverage to urban areas where most people work or are engaged in other livelihood activities. This calls for flexible immunisation hours and days including opening multiple dose vaccine even for a few children to avoid missed opportunities.

The problem is further exacerbated by bad attitude of health workers when mothers arrive late for sessions or any other reasons, in addition, lack of communication and information transfer between the health providers and the caretakers act as deterrents to accessing services (Kiwanuka et al 2008).

Adequacy challenges in terms of limited operating hours and service delivery schedules have contributed to the problem of utilization, including urban areas as more and more women who are required to take their children for vaccinations are also into paid jobs or livelihood activities. The clinic hours that are open for the immunisations sessions are actually the peak business hours for business or work. In view of this, the government and district authorities should make a deliberate policy to extend hours and encourage health centers to offer services over the weekend and holidays. However, this requires planning and allocating more funds to pay staff over time allowances. In addition, immunisation should be institutionalized in all health facilities that attend to children including outpatient departments. The responsiveness of health services may be enhanced by improving staff attitudes and communication skills (Schellenberg etal, 2004).

Finally, the discussion of factors affecting coverage was guided by access framework and accordingly I think it has assisted in sufficiently analyzing the problems under review. However, due to the several components in the model it was difficult to discuss all of them exhaustively, I ended up summarising the other issues within the Five As as the model stipulates that access is access factors are interlinked and dependent and improved access and health care utilization have to be combined with high quality of care in order to reach positive outcomes (Obrist et al, 2007).

7.5 Conclusion.

As the world moves towards the post-2015 development agenda, it is important to draw attention to the un-finished agenda of reaching the last numbers of unvaccinated children found in hard to reach remote areas. Despite having reached very high vaccination levels up to 2008, coverage has dropped in recent years in Zambia. The thesis has highlighted a number of reasons attributed to the decrease such as inadequate infrastructure, inadequate equipment, insufficient health workers, geographical barriers, long walking distances, inadequate opening hours and days including bad health worker's attitude and inadequate information to care takers and the community at large. Studies conducted in the country alluded the decrease to the above factors that have worsened in recent years. To improve coverage there is need for renewed energy and concerted efforts from all

sectors, government and partners alike so that evidence-based strategies can be implemented and strengthened where need be in order to achieve, once more, the high coverage levels which had characterized Zambia until recent years.

7.6 Recommendations

In view of the study findings the following recommendations have been made

- **Program Data**
  Government should assists the immunisation programme to sort out this challenge through supporting districts to conduct head count at the same time allow districts to use head count figures for planning to avoid the prevailing situation of over and under reporting. There is need for the programme to conduct periodic coverage surveys for validation and performance evaluation. The responsibility for planning and monitoring needs to be strengthened at the provincial and district levels. The latter is the level at which critical information, such as accurate valid district-based estimates of coverage should be monitored and improve timely communication of information.

- The Ministry should support operational research in districts in order to identify district specific barriers that are hindering immunisation utilisation.

- The government should increase involvement of private providers in service provision either through sub contracting or allowing them to charge minimal service fees while government supplies free vaccines and logistics.

- The Ministry should increase funding for immunisation activities especially outreach, immunisation training, maintenance of cold chain equipment and supportive supervision.

- Both the government and districts should strengthen community links and use of community structures such as politicians and community leaders for social mobilisation including the media to increase awareness on the importance of routine immunisations.

- The government should allow health workers such as nurses to form their own union than the current situation where they have to bargain within the general civil servants.

- Districts should strengthen RED strategy approach and introduce flexible schedules for vaccinations; use every available opportunity even if it means opening vials for a few children.

REFERENCES

Abdulhussein Z., Deamond S., Elliot R. et al: 2011 "Barriers to Receiving and Reporting Childhood Immunisations: Parents' Perspectives.

Alastair McFarlane 2009. Can the biomedical community eradicate a disease like measles? National institute for medical research. Mill hill essay.

Amber G. Kunkel E, S. Van Itallie y, Duo Wu z , 2013. Optimal Distribution of Medical Backpacks and Health Surveillance Assistants in Malawi. Department of Epidemiology, Harvard School of Public Health, Boston, MA

Ashraf N, Bandier S, Lee S & Musoanda M. 2012. Recruiting and Motivating Community Health Workers in Zambia. Ministry of Health. Lusaka.

Bhagyalaxmi A, Kedia G, Rawal VS 2007. Study of incidence of measles and vaccination coverage in Ahmedabad urban slums. Indian J Public Health ; 51: 52–53. [PubMed]

Bloom DE. (2011). The Value of Vaccination. Adv Exp Med Biol, 697:1–8

Borus P. K. 2004. Missed opportunities and inappropriately given vaccines reduce immunisation coverage in facilities that serve slum areas of Nairobi. East African Medical Journal. Vol. 81 No. 3. March 2004

Bosu W. K., Ahelegbe D., Edum-Fotwe E., Bainson K A, and Kobina Turkson P., 1997. "Factors influencing attendance to immunization sessions for children in a rural district of Ghana," Acta Tropica, vol. 68, no. 3, pp. 259–267.

Brandt A. M. 2013. Perspective How AIDS Invented Global Health. The New England Journal Med 2013; 368:2149-2152 .

Brown J, Monasch R, Bicego G, Burton A, Boerma JT. (2002) Assessment of the quality of estimates of child immunization coverage from population-

based surveys: MEASURE Evaluation Working Paper series. Chapel Hill (North Carolina): University of North Carolina at Chapel Hill.

Brugha R, Starling M, Walt G. 2002. GAVI, the first steps: 2002 lessons for the Global Fund. Lancet 2002; 359: 435–38.

Bucagum M, Kagubare J. M, Basinga P, Ngabo F, Timmon B, K and Lee A. 2012. Impact of Health systems strengthening on coverage of maternal health services in Rwanda, 2000-2010: a systematic review. Reproductive Health Matters. Vol 20.Issue 39: pp 50-61.

Burns I. T. & Zimmerman R, K. 2005. Immunization barriers and solutions. The journal of family practice, VOL. 54, NO. 1.

Burton A, Monasch R, Lautenbach B, Gacic-Dobo M, Neill M, et al. (2009) WHO and UNICEF estimates of national infant immunization coverage: methods and processes. Bull World Health Organ 87: 535–541.

C. Baume, D. Helitzer, and S. P. Kachur, "Patterns of care for childhood malaria in Zambia," Social Science and Medicine,vol.51, no. 10, pp. 1491–1503, 2000.

CARE India. 2008. RACHNA program (2001–2006) executive summary: what we have learnt so far. New Delhi, India: CARE India;

CDC 2013. Progress toward interruption of wild poliovirus transmission-worldwide, January 2011-March 2012. MMWR 2012:61:353-7

Chadambuka A., Chimusoro A., Apollo T., Tshimanga M., Namusisi O and. Luman E. T. 2011. The need for innovative strategies to improve immunisation services in rural Zimbabwe. Health Studies Office, P.O. Box CY1122, Causeway.

Chinkonde, J.R., Sunndy, J. & Martinson, F. 2009. The prevention of mother to child HIV transmission program in Lilingwe, Malawi: Why do so many women drop out. Reproductive health matters,17(33),pp.143-51.

Christopher H. Herbst M., Vledder. K., Campbell. M & SjÃqblom A. 2009. The Human Resources for Health Crisis in Zambia. An Outcome of Health Worker Entry, Exit, and Performance within the National Labor Health Market.

Cockcroft A., Andersson N., Omer k., et al 2009. One size does not fit all: local determinants of measles vaccinations in four districts of Pakistan. BMC International Health and Human Rights 9 (Suppl 1):S4

Colton, C. 2005. Preventing mother to child transmission of HIV in Kenya. Pathfinder International's Experience: 2002-2005.

Dambisya Y, M. 2007. A review of non-financial incentives for health worker retention east and southern Africa. Regional Network for Equity in Health in East and Southern Africa (EQUINET) and the East,Central and Southern African Health Community (ECSA-HC). EQUINET discussion paper number 44with ESC A-HC. University of Namibia, Training and Research Support Centre (TARSC) and SIDA. (Sweden).

Darshana V, Ramesh K. 2003. Immunization promotion in Ahmedabad. A paper presented at the Urban Health Consultation organized by Environment Health Project and Ministry of Health and Family Welfare. 2003 June 30- July 1; Bangalore, India

Davis J., Luchters S., Holmes W. 2012. Men and maternal and newborn health: benefits, harms, challenges and potential strategies for engaging men, Compass: Women's and Children's Health Knowledge Hub. Melbourne, Australia.

Dieleman M, Watson M, & Sisimayi C. 2012. Impact assessment of the Zimbabwe Health Worker Retention Scheme. Ministry of Health Zimbabwe & DFID Human Development Resource Centre 295358

Djibouti M., Gotsade G., Zoid A. et al 2009. The role of suportive supervision on immunization program outcome- a randomized fiel trial from Goegia. BMC International and Human Rights 9 (Suppl 1): S11

Draft EPI coverage survey report 2011. Ministry of health. Zambia

Edmunds W. J. and Brisson M 2003. Economic Evaluation of Vaccination Programs: The Impact of Herd-Immunity, Med Decis Making 2003 23: 76 DOI: 10.1177/0272989X02239651

Ensor T. and Cooper S. 2004 "Overcoming barriers to health service access: influencing the demand side," Health Policy and Planning,vol.19,no.2,pp.69–79.

Ewles L. and Simnett I. 1999. Promoting Health: A Practical Guide Bailliere Tindall, Edinburgh, 4th edition.

Fine P, Eames K, and Heymann D, L 2011. ''Herd Immunity'': A Rough Guide. Department of Infectious Disease Epidemiology, London School of Hygiene and Tropical Medicine, London, United Kingdom.

Gargano LM, Thacker N, Choudhury P, Weiss PS, Pazol K, Bahl S, Jafari HS, Arora M, Orenstein WA, Hughes JM, Omer SB. 2012 . Attitudes of pediatricians and primary health center physicians in India concerning routine immunization, barriers to vaccination, and missed opportunities to vaccinate. Pediatr Infect Dis J. 2012 Feb;31(2):e37-42.

Gayatri M. 2010. Zambia: Barriers to Traditional Media Use and Access

Gelman A, Rubin DB (1992) Inference from iterative simulation using multiple sequences. Stat Sci 7: 457–472.

Ghana Statistical Service, Ghana Health Service, ICF Macro (2009) Ghana demographic and health survey 2008. Accra (Ghana): Ghana Statistical Service.

Glatman-Freedman A and Nichols C.A. 2012 .The effect of social determinants on immunization programs. Human Vaccines & Immunotherapeutics 8:3, 293–301; March 2012;G 2012 Landes Bioscience.

Gow J., George .G, Mutinta G., Mwamba S and Ingombe L. 2011. Health worker shortages in Zambia: An assessment of government responses. Macmillan Publishers Ltd. 0197-5897. Journal of Public Health Policy 1–13.

Grais RF, Dubray C, Gerstl S, Guthmann JP, Djibo A, et al. 2007. Unacceptably high mortality related to measles epidemics in Niger, Nigeria, and Chad. PLoS Med 4: e16.

Halwindi .,H, Siziya S., Magnussen P., and Olsen A. 2013, Factors Perceived by Caretakers as Barriers to Health Care for Under-Five Children in Mazabuka District, Zambia. ISRN Tropical Medicine . Volume 2013.

Health Facilities' Survey. 2011. M&E unit, MOH, Zambia.

Hendryx MS, Ahern MM, Lovrich NP, McCurdy AH. 2002 . Access to healthcare and community social capital. Health Serv Res. 2002;37:87–103

Islam W, Ahmed NU & Rahman ZU. 1998. Capacity building approach in health and family planning in Bangladesh. Washington, DC: Partnership for Child Health Care, Basic Support for Institutionalizing Child Survival (BASICS), http://pdf.usaid.gov/pdf_docs/PNACH042.pdf.

Jani J. V., Schacht C. D., Bjune G. 2008. Risk factors for incomplete vaccination and missed opportunities for immunization in rural Mozabique. BMC Public health 8:161

Jones, S, A., Sherman, G, G. & Varga, C,A. 2005. Exploring socio-economic conditions and poor follow-up rates of HIV-exposed Infants in Johansburg, South Africa. AIDS care, 17 (4).pp.466-70.

Kachimba, J., S. & Mwaba, P. (2007). The human resources for health crisis in Zambia: deaths, departures, demoralizing conditions of service and a disinterested diaspora. Medical Journal of Zambia, 34(1), Editorial.

Kiwanuka S. N., Ekirapa E. K., Peterson S. et al. 2008. "Access to and utilisation of health services for the poor in Uganda: a systematic review of available evidence," Transactions of the Royal Society of Tropical Medicine and Hygiene,vol. 102, no.11, pp.1067–1074,

Kombe G., Galaty D., Mtonga V and Banda P. 2004. Human Resource Crisis in Zambia's Health System: A Call for Urgent Action. Assessment Report. Bethesda, MD: The Partners for Health Reformplus Project, Abt Associates Inc.

Learning from Those Who are Hardest to Reach: Audience Scapes, InterMedia Development Research Briefs.

Lessler J, Moss WJ, Lowther SA, Cummings D,A, T .2010 Maintaining high rates of measles immunization in Africa. Epidemiol and Infect. E-pub ahead of print.

Levin A, Kaddar M. 2011.Role of the private sector in the provision of immunization services in low- and middle-income countries. Oxford Journals. Medicine. Health Policy. Volume 26 Issue supp l.Pp.i4-i12.

Levin Ann & Kaddar Miloud 2011. Role of the private sector in the provision of immunization services in low- and middle-income countries. Oxford Journals

Levy-Bruhl D, Soucat A, Diallo S, et al. 1994. Integration of the expanded program on immunization into primary health care: examples of Benin and Guinea. Sante 1994; 4:205–12.

Lu C, Chin B, Lewandowski JL, Basinga P, Hirschhorn LR, et al. (2012) Towards Universal Health Coverage: An Evaluation of Rwanda Mutuelles in Its First Eight Years. PLoS ONE 7(6): e39282.

Luman E. 2009. Evaluating integrated service delivery, adding other services to routine immunization visits: the CDC experience

[PowerPointslides]. New York: WHO/UNICEF Global Immunization Meeting,2009.

Makasa E. 2008. The Human Resource crisis in the Zambian Health Sector – a discussion paper. Medical Journal of Zambia, Volume 35 Number 3

Manzi, M., Zachariah, R., Teck, R., Buhendwa, L., Kazima, J., Bakali E., Firmenich, P., & Humblet,P. 2005. High acceptability of vouluntary counseling and HIV- testing but unacceptable loss to follow up in a prevention of HIV transmission programme in rural Malawi: scaling-up requires a different way of acting. Tropical medicine & International health: TM & IH (12), pp. 1242-50.

Mathanga D, Luman E, Campbell C, Silwimba C & Malenga G. 2009. Integration of insecticide-treated net distribution into routine immunization services in Malawi: a pilot study. Trop Med Int Health 2009; 14:1–10.

McBean AM, Foster SO, Herrmann KL, Gateff C (1976) Evaluation of a mass measles immunization campaign in Yaoundé Cameroun. Trans R Soc Trop Med Hyg 70: 206–212.

MCDMCH 2012. Re-alignment of the department of mother and child health. Ministry of Community Development Mother and Child Health. Zambia.

Medicine Health Policy and Planning Volume 26, Issue suppl 1 Pp. i4-i12

Ministry of Health Child health EPI Data quality self assessment. 2012. Ministry of Health. Zambia.

Ministry of Health Human resource strategic plan 2011-2015. 2011. Ministry of Health Lusaka. Zambia.

Ministry of Health Child Health Policy 2008. Ministry of health Zambia.

Ministry of Health EPI coverage survey 2011, (draft report). Ministry of Health. Zambia.

Ministry of Health EPI Data Quality Audit draft report 2012. Ministry of Health. Zambia.

Ministry of Health EPI Manaual. 2009. Ministry of Health. Zambia.

Ministry of Health EPI manual 2009. Child Health Unit. Ministry of Health. Zambia.

Ministry of health National health strategic Plan 2005-10. Ministry of Health. Zambia.

Ministry of Health National Health Strategic Plan 2011-15. Ministry of Health. Zambia.

Ministry of Health, Kingdom of Cambodia. 2002. Financial sustainability plan for immunization services. Submitted to GAVI. 2002. http://www.who. int/immunization_financing/countries/khm/en/cambodia_fsp.pdf.

Minstry of Health 2010. Health facility survey. Ministry of Health. Zambia.

MOH 2012. Surveillance reports. Ministry of Health. Zambia

Morrow, H., Collins B.K., and Smith D.R. (2007) 'Public health coalitions: patterns and perceptions in state immunisation programs'. Journal of Health and Human Services Administration. 30(2). pp. 156–175.

MSF Access Campaign: 2012. Easier-to-use vaccines are needed for hard-to-reach children. Médecins Sans Frontières, Rue de Lausanne 78, CP 116, CH-1211 Geneva 21, Switzerland.access@msf.org.

Mukuka C., Siame M., Kalesha P., and. Mwinga K. 2004. Zambia Child Health Situation Analysis, MoH/CBoH/WHO/UNICEF.

Munthali AC. 2007. Determinants of vaccination coverage in Malawi: evidence from the demographic and health surveys. Malawi Med J 19: 79–82.

Murray CJL, Shengelia B, Gupta N, Moussavi S, Tandon A, et al. (2003) Validity of reported vaccination coverage in 45 countries. Lancet 362: 1022–1027.

Mutua MK, Kimani-Murage E, Ettarh RR. 2011 Childhood vaccination in informal urban settlements in Nairobi, Kenya: who gets vaccinated? BMC Public Health ; 11: 6. [PMC free article] [PubMed]

Mwale H & Smith S. 2011. Human Resources Retention Scheme: Qualitative and Quantitative Experience from Zambia. HSSP. USAID.

Nikisi J., Kanjipite W., Sarkar S., Holschneider. S. 2013. Quality improvement of Tb services. Assessment of Provider Adherence to TB Evidence-based Standards and Guidelines in Zambia. Jhpiego Corporation University Research Co., LLC

Orentien W A, Hinman R A and Strebel P M. 2007. Eradicating measles: a feasible goal? School of medicine, Emroy vaccine centre. Atlanta, U.S.A. Pediatric Health 2007 1 (2).

Partapuri1 T., R and Sequeira J. 2012. Integrated Delivery of Health Services During Outreach Visits: A Literature Review of Program Experience through a Routine Immunization Lens. Maternal and Child Health Integrated Program, John Snow Inc, 1776 Massachusetts Avenue NW, Washington, DC 20036.

Partnership with World Vision in strengthening EPI in Afar Regional State Routine EPI activities in Ethipia **WHO, 2013.**

Post Introduction Evaluation of the Pentavalent vaccine in zambia final Report WHO/AFRO/ IST East & Southern Africa, WHO/Zambia, UNICEF/Zambia, CDC, USAID, MOH Zambia, February 2009.

Poverty Reduction Strategy Paper Zambia 2002. Zambia.

R. Sauerborn, A. Nougtara, M. Hien, and H. J. Diesfeld. 1996. "Seasonal variations of household costs of illness in Burkina Faso," Social Science and Medicine,vol.43,no.3,pp.281–290,

Razum, O. 1993, Immunisation programs in Zimbabwe: Mothers voice their opinion on immunization services.

Rispel, L, C., Pelter, k., Phsawana-Mafuya, N., Metcalf, C.A & Treger, L. 2009. Assessing missed opportunities for the prevention of mother- to- child HIV transmission in an Eastern Cape local service area. South African medical journal. Suid-Afrikaanse tydskrif vir geneeskunde, 99 (3), pp. 174-9.

Ronveaux O, Rickert D, Hadler S, Groom H, Lloyd J, et al. 2005. The immunization data quality audit: verifying the quality and consistency of immunization monitoring systems. Bull World Health Organ 83: 504–510.

Sasaki, S., Igarashi K., Fujino Y., Comber A. J., Brunsdon C., Muleya C. M., Suzuki H. 2010. The impact of comm unity-based outreach immunisation services on immunisation coverage with GIS network accessibility analysis in peri-u rban

Sauerborn R., Nougtara A., Hien M., and. Diesfeld H. J, 1996. "Seasonal variations of household costs of illness in Burkina Faso," Social Science and Medicine,vol.43,no.3,pp.281–290,

Sawhney Y. M., & Favin M., 2009. Epidemiology of the Unimmunized Child Findings from the Grey Literature Prepared for the World Health Organization. (Studies from -Niger (Keith 1992), Kenya (Abilla 1993), Bangladesh (Perry, Arifeen, Hossein & Weirbach 1996). World Health Organisation.

Schellenberg J. A., Bryce J., De Savigny et al D., 2004. "The effect of Integrated Management of Childhood Illness on observed quality of care of under-fives in rural Tanzania,"Health Policy and Planning, vol.19, no.1, pp.1–10.

Schröder-Bäck P, Brand H, Escamilla I, Davies JK, Hall C, Hickey K, et al. 2009. Ethical evaluation of compulsory measles immunisation as a benchmark for goodhealth management in the European Union. Cent EurJ Public Health 2009; 17:183-6; PMID:20377045.

Schwartz B, Bushan I 2004 . Improving immunization equity through a public-private partnership in Cambodia. Bulletin of the World Health Organization ;82:661-7.MedlineWeb of Science

Schwarz N.G., Gysel M., Pell C. et al 2009. Reasons for non-adherence to vaccination at the mother and Child care clinics(MCCs) in Lambarene, Gabon. Vaccinae 27 (39): 5371-5375.

Siddharth A, Bhanot A, Geetanjali G. 2005. Understanding and Addressing Childhood Immunization Coverage in Urban Slums USAID-Environmental Health Project (EHP). Indian Pediatrics. volume 42 july 17, 2005.

Singh P, Yadav R. 2001. Immunization status of children in Bimaru states. Indian J Pediatr; 68: 495-500.

Sloand E. and Gebrian B. 2006 "Fathersclubstoimprovechildhealthin rural Haiti," Public Health Nursing,vol.23,no.1,pp.46–51,2006

Soeung SC, Grundy J, Ly CK, et al. 2006. Improving immunization coverage through budgeted micro-plans and sub-national performance agreements: early experience from Cambodia. Asia Pac J Public Health 2006; 18:29–38.

Statistics Sierra Leone, Ministry of Health and Sanitation, ICF Macro. 2009. Sierra Leone demographic and health survey 2008. Freetown (Sierra Leone): Statistics Sierra Leone.

Steinglass R, Fields R. Immunization: 2000. Challenges and Opportunities. Global Health Link.The Newsletter of the Global Health Council, 2000; 103: 15-22.

Stekelenburg J, Jager BE, et al. 2004. Health care seeking behavior and utilization of traditional healers in Kalabo, Zambia. Health Policy:

Stekelenburg J., Kyanamina S.S., Wolffers I. (2003) Poor performance of community health workers in Kalabo District, Zambia Health Policy, 65 (2) , pp. 109-118.

Stekelenburg, J., Kyanamina, S., Mukelabai, M., Wolffers, I. and van Roosmalen, J. 2004, Waiting too long: low use of maternal health services in Kalabo, Zambia. Tropical Medicine & International Health, 9: 390–398

Stevenson S, Candries B. Ethiopia national immunization program costing and financing assessment. 2002. http://www.who.int/immunization_financing/analyses/en/wb_ethiopia.pdf.

Stringhini S., Thomas S., Bidwell P., Mtui T., and A. Mwisongo. 2009, "Understanding informal payments in health care: motivation of health workers in Tanzania, "HumanResourcesforHealth,vol.7, article 53, 2009

Toikilik s., Tuges G., Lagani J., et al 2010. Are hard- to-reach populations being reached with immunizations services? Findings from the 2005 Papua New Guinea national immunization coverage survey. Vaccine 28:4673-4679.

Topuzo˘glu, A. Ay. P., Hidiroglu S., and Y. Gurbuz. 2007. "The barriers against childhood immunizations: a qualitative research among socio-economically disadvantaged mothers," European Journal of Public Health,vol.17,no.4,pp.348–352,2007.

United Nations Children's Fund–World Health Organization (UNICEF/WHO). Malaria control and immunization: a sound partnership withgreat potential. 2004. http://www.emro.who.int/RBM/RBM-EPI-EN.pdf.

USAID 2010. Improving Immunisation coverage at Community level, Available online: http: // Kenya. Usaid.gov/success-story/138.

Victora C. G,. Wagstaff A,. Schellenberg J. A,. Gwatkin D,.Claeson M, and. Habicht J. P. 2003. "Applying an equity lens to childhealth and mortality: more of the same is not enough," Lancet, vol.362,no.9379,pp.233–241,

Wallinga J, Heijne JCM, Kretzschmar M. 2005. A measles epidemic threshold in a highly vaccinated population. PLoS Medicine 2: e316.

Walsh A., Ndubani P. , Simbaya J., Dicker P and Brugha R 2010 .Task sharing in Zambia: HIV service scale-up compounds the human resource crisis. BMC Health Services Research 2010, 10:272 doi: 10.1186/1472-6963-10-272.

WHO 2008 Reaching every District approach. A Guide for District Health Management Teams. WHO.

WHO Immunization policy. 1996.: publication WHOGPV/GEN/95.03 REV 1. Geneva: World Health Organization, Global Programme for Vaccines and Immunizations,

WHO, 2012. Global and regional immunization profile. Based on global DTP3 coverage Geneva: WHO. Available at: http://apps.who.int/immunization_monitoring/en/globalsummary/GS_GLOProfile.pdf

WHO, UNICEF. 1978. Primary Health Care, Report on the International Conference on Primary Health Care, Alma Ata, USSR, December 6–12, 1978. Geneva: World Health Organization.

Wiysonge C.S, Uthman O.A, Ndumbe P.M, Hussey G.D. 2012. Individual and Contextual Factors Associated with Low Childhood Immunisation Coverage in Sub-Saharan Africa: A Multilevel Analysis. PLoS ONE 7(5): e37905. doi:10.1371/journal.pone.0037905.

Wonodi C, Stokes-Prindle C, Aina M, Oni G, Olukowi T, Pate M A, Privor-Dumm L & Orin L. 2012. Landscape Analysis of Routine Immunization in Nigeria: Identifying and addressing barriers to immunization coverage. International Vaccine Access Center (IVAC) Johns Hopkins Bloomberg School of Public Health 3. Rangos Bldg, Suite 600 855 N. Wolfe Street Baltimore, MD 21205

World Bank world bank working paper no. 214.

World Health Organinsation 2009. Increasing access to Health workers in remote and rural areas through improved retention. Available online: hht://.who/hrh/migration/hmr expert meeting dolea.pdf.

World Health organistion 2010. Why do some children remain un vaccinated? Available http://www.who.int/immunisation delivery/system policy/ Epidemiology the unvaccinated.pdf.

World Health Organization (2010) WHO-UNICEF estimates of MCV coverage. Geneva: World Health Organization.

World Health Organization 2012. WHO vaccine-preventable diseases monitoring system: 2011 global summary. Geneva, Switzerland: World Health Organization; 2011. Available at http://www.who.int/vaccines/globalsummary/immunization/countryprofile select.cfm

World Health Organization 2002. Programming for Male Involvement in Reproductive Health: Report of the Meeting of WHO Regional Advisers in Reproductive Health WHO/PAHO,UNDP/UNFPA/WHO/World Bank/TDR, Washington, DC, USA,

World Health Organization. 2003. The immunization data quality audit (DQA) procedure. WHO/V&B/03.19. Geneva: World Health Organization.

Zambia Central Statistical Office, 2010 Census of Population and Housing. Central Statistical Office. Zambia

Zambia country GAVI Health Systems Strengthening Proposal 2007. Ministry of Health. Zambia

Zambia Demographic and Health Survey 2007, Central statistical Office, Zambia.

Zambia Global Health Initiative 2011-1015. Zambia.

Annex: 1

Operational Definitions:

1. **Reach Every District (RED) Approach**- Implemented since 2002, the Reach Every District (RED) approach emerged from the World Health Organization (WHO) and partners in their attempt to devise an innovative strategy to improve stagnating immunization coverage and effectiveness in Africa. The RED approach outlines five operational components that are specifically aimed at improving immunization coverage in every district.
    - RED Approach components
        - Effective planning and management of resources: ensuring effective management of human, financial and material resources at every governing level.
        - Reaching all target populations: reach out to previously under-served, un-reached communities, in giving support and access to services.
        - Supportive supervision: providing local staff with on-site training by supervisors.
        - Monitoring for action: promoting the use of data for action through utilization of data quality self- assessment tools at all governing levels.
        - Linking services with communities: linking communities with health services, through regular meetings between communities and health staff. (Source: WHO 2009).
2. **Expanding immunization coverage Goal:**
    - By 2020, ensure routine immunization of children under one year of age reaches 90 per cent nationally and at least 80 per cent coverage in every district or equivalent administrative unit.

      Extend the benefits of new and improved vaccines to countries in need and provide twice-annual vitamin A supplementation or food fortification where necessary. Source: UNICEF/WHO, November 2011
3. **Missed opportunities**

- Programme on Immunization (EPI) recommends that children be vaccinated at every contact with a health facility. Failure to vaccinate a child who attends immunisation or curative clinics with vaccine(s), for which he/she is eligible in the absence of any known contra-indication, constitutes a missed immunization opportunity. Missed immunisation opportunities arise because of system factors such as non availability of vaccines, failure by facilities to immunise on all days of the week, or negative parental beliefs that prevent them from allowing their children to be vaccinated. Source: Borus 2004.

4. Tracer/proxy indicators

- Diphtheria-tetanus-pertussis (DTP3) and measles vaccinations are most often used to monitor childhood vaccination coverage rates and trends (WHO, 2001, Brugha 2002*)*.
- For this analysis, I selected the proportion of children receiving DTP3 vaccination as an indicator of vaccination coverage. The numerator was the number of children who received three doses of DTP, in accordance with WHO recommended schedule. The denominator indicator was the population of children surviving until age 12 months for each birth cohort (WHO 1996).

5. Immunisation Goal

Zambia's immunization goal goal is based on GIVS strategy 2006-2015 which states that By 2010 or earlier:

- Increase coverage. Countries will reach at least 90% national vaccination coverage and at least 80% vaccination coverage in every district or equivalent administrative unit.
- Reduce measles mortality. Globally, mortality due to measles will have been reduced by 90% compared to the 2000 level. Source: GIVS 2006.

Annexure 2

Provincial performance 2012

Province	DPT3 Coverage (percent)
Central	100
Copperbelt	82
Eastern	85
Luapula	86
Lusaka	64
Northern	81
North-Western	85
Southern	62
Western	77
Grand Total	**78**

Annexure 3

District specific performance 2012

Province Name	District Name	DPT3			
Southern	Sinazongwe	36%	Southern	Gwembe	81%
Northern	Kaputa	41%	Western	Lukulu	81%
Central	Mkushi	43%	Eastern	Chipata	82%
Southern	Kalomo	47%	North-Western	Chavuma	82%
Southern	Livingstone	53%	Copperbelt	Chingola	83%
Southern	Mazabuka	55%	Copperbelt	Kalulushi	83%
Lusaka	Luska	56%	Eastern	Katete	83%
Western	Sesheke	62%	Eastern	Petauke	83%
Northern	Isoka	63%	Northern	Mungwi	83%
Lusaka	Luangwa	64%	Northern	Mbala	83%
Lusaka	Kafue	65%	Western	Mongu	84%
Western	Shang'ombo	66%	Northern	Mpulungu	85%
Copperbelt	Kitwe	67%	Northern	Mpika	86%
North-Western	Zambezi	69%	Western	Kalabo	87%
Eastern	Lundazi	70%	Luapula	Milenge	87%
Southern	Kazungula	71%	North-Western	Mwinilunga	87%
Southern	Monze	71%	Luapula	Mansa	88%
Lusaka	Chongwe	71%	Northern	Chinsali	88%
Copperbelt	Ndola	72%	North-Western	Kasempa	88%
Central	Kabwe	72%	Copperbelt	Masaiti	89%
Copperbelt	Mufulira	73%	North-Western	Kabompo	89%
Central	Itezhi-tezhi	74%	Eastern	Nyimba	91%
Luapula	Chiengi	74%	Luapula	Samfya	91%

Luapula	Kawambwa	75%	Luapula	Mwense	91%
North-Western	Mufumbwe	75%	Copperbelt	Lufwanyama	92%
Northern	Luwingu	76%	Eastern	Chama	95%
Eastern	Mambwe	76%	Southern	Namwala	96%
Copperbelt	Chililabombwe	77%	Luapula	Nchelenge	97%
Western	Kaoma	78%	Southern	Choma	98%
Southern	Siavonga	78%	Central	Mumbwa	99%
Northern	Nakonde	78%	Eastern	Chadiza	100%
Copperbelt	Luanshya	78%	North-Western	Solwezi	101%
Northern	Mporokoso	79%	Central	Chibombo	104%
Northern	Kasama	80%	Copperbelt	Mpongwe	106%
Western	Senanga	80%	Central	Kapiri-Mposhi	106%
			Central	Serenje	113%
			Northern	Chilubi	127%

Annexure 4

Coverage 2010 DTP3 and Measles 2012

District	DTP3 %	District	MCV1 %
Mufulira	66%	Kaputa	46%
Mpika	75%	Mazabuka	55%
Mwinilunga	77%	Luangwa	60%
Livingstone	78%	Sinazongwe	61%
Kabwe	79%	Isoka	63%
Katete	79%	Sesheke	63%
Ndola	82%	Lusaka	64%
Lukulu	83%	Kafue	65%
Chilubi	83%	Kabwe	65%
Zambezi	84%	Shang'ombo	67%
Chililabombwe	84%	Kitwe	69%
Nyimba	84%	Lukulu	71%
Mazabuka	85%	Luwingu	72%
Sesheke	85%	Kawambwa	73%
Luanshya	85%	Chililabombwe	73%
Chingola	85%	Chiengi	74%
Chiengi	86%	Mambwe	75%
Mongu	86%	Mufumbwe	75%
Sinazongwe	87%	Itezhi-tezhi	76%
Kitwe	87%	Kalabo	77%
Masaiti	88%	Kalulushi	78%
Shang'ombo	89%	Senanga	78%
Chipata	89%	Siavonga	78%
Chadiza	89%	Ndola	78%
Luangwa	90%	Chipata	79%

Lundazi	90%	Kalomo	79%
2010- 2012 DTP3		**2010- 2012 Measles**	
Kasempa	91%	Katete	79%
Senanga	91%	Mbala	80%
Namwala	91%	Mufulira	80%
Chavuma	92%	Mongu	81%
Kalabo	93%	Milenge	81%
Samfya	94%	Nakonde	81%
Kabompo	95%	Kazungula	82%
Mbala	95%	Livingstone	82%
Nchelenge	96%	Nyimba	82%
Mufumbwe	96%	Lundazi	83%
Milenge	96%	Mwense	83%
Kaoma	96%	Mwinilunga	84%
Kawambwa	97%	Kaoma	86%
Luska	98%	Masaiti	86%
Chama	98%	Kasempa	87%
Monze	100%	Mansa	88%
Mansa	101%	Mungwi	88%
Mpulungu	101%	Chama	89%
Chongwe	101%	Nchelenge	89%
Mwense	102%	Chingola	90%
Kaputa	104%	Luanshya	90%
Mkushi	104%	Zambezi	91%
Kalulushi	105%	Monze	93%
Kafue	105%	Lufwanyama	93%
Lufwanyama	106%	Kabompo	96%
Kalomo	106%	Namwala	97%

Mungwi	107%	Chadiza	98%
Kapiri-Mposhi	109%	Mpulungu	99%
Mambwe	109%	Choma	104%
Isoka	109%	Kasama	104%
Chibombo	109%	Petauke	104%
Choma	111%	Mkushi	105%
Kazungula	113%	Mumbwa	105%
Kasama	113%	Serenje	107%
Mporokoso	114%	Mpongwe	107%
Petauke	118%	Chibombo	108%
2010 -2012 DPT 3		**2010 -2012 mealses**	
Luwingu	119%	Kapiri-Mposhi	108%
Serenje	120%	Chilubi	110%
Mumbwa	121%	Gwembe	112%
Chinsali	121%	Samfya	113%
Solwezi	124%	Chavuma	118%
Siavonga	126%	Chinsali	123%
Itezhi-tezhi	134%	Chongwe	128%
Gwembe	142%	Solwezi	139%
Mpongwe	142%	Mpika	144%
Nakonde	159%	Mporokoso	176%

Annex 5

Coverage 2011 DTP3 and MCV1

District	DTP3 %	District	MCV1 %
Mazabuka	16%	Chadiza	68%
Sinazongwe	26%	Chama	47%
Livingstone	28%	Chavuma	61%
Kitwe	30%	Chibombo	99%
Namwala	30%	Chiengi	41%
Mufulira	34%	Chililabombwe	42%
Siavonga	34%	Chilubi	61%
Chililabombwe	34%	Chingola	39%
Kawambwa	37%	Chinsali	79%
Luanshya	38%	Chipata	49%
Ndola	39%	Choma	45%
Chingola	41%	Chongwe	49%
Samfya	43%	Gwembe	62%
Monze	43%	Isoka	42%
Chama	44%	Itezhi-tezhi	58%
Kalulushi	44%	Kabompo	53%
Lusaka	44%	Kabwe	74%
Kaputa	45%	Kafue	45%
Kafue	46%	Kalabo	77%
Kalomo	47%	Kalomo	63%
Kazungula	47%	Kalulushi	49%
Itezhi-tezhi	47%	Kaoma	69%
Sesheke	47%	Kapiri-Mposhi	83%
Isoka	48%	Kaputa	49%
Chiengi	48%	Kasama	67%

Mambwe	48%	Kasempa	83%
Nchelenge	49%	Katete	60%
Zambezi	49%	Kawambwa	39%
Masaiti	50%	Kazungula	52%
Mansa	51%	Kitwe	33%
Milenge	51%	Livingstone	31%
Choma	52%	Luangwa	53%
Chipata	52%	Luanshya	44%
Chongwe	52%	Lufwanyama	69%
2011 DTP3		**2011 MCV1**	
Lundazi	53%	Lukulu	48%
Luangwa	53%	Lundazi	58%
Luwingu	53%	Lusaka	48%
Lukulu	54%	Luwingu	51%
Gwembe	54%	Mambwe	49%
Kabompo	55%	Mansa	47%
Mpika	58%	Masaiti	51%
Nyimba	58%	Mazabuka	59%
Kasama	58%	Mbala	68%
Shang'ombo	59%	Milenge	39%
Petauke	59%	Mkushi	74%
Katete	60%	Mongu	59%
Mongu	60%	Monze	53%
Chavuma	63%	Mpika	77%
Mbala	64%	Mpongwe	67%
Mwinilunga	65%	Mporokoso	69%
Mwense	66%	Mpulungu	66%
Mkushi	66%	Mufulira	40%
Chilubi	67%	Mufumbwe	69%

Kaoma	67%	Mumbwa	92%
Lufwanyama	70%	Mungwi	76%
Mpulungu	71%	Mwense	61%
Mpongwe	72%	Mwinilunga	81%
Chadiza	72%	Nakonde	75%
Nakonde	73%	Namwala	26%
Kabwe	73%	Nchelenge	52%
Solwezi	73%	Ndola	41%
Chinsali	73%	Nyimba	61%
Mufumbwe	74%	Petauke	55%
Senanga	74%	Samfya	49%
Mporokoso	76%	Senanga	75%
Mungwi	77%	Serenje	91%
Kalabo	77%	Sesheke	53%
Mumbwa	86%	Shang'ombo	58%
Kapiri-Mposhi	87%	Siavonga	32%
Kasempa	91%	Sinazongwe	24%
Serenje	93%	Solwezi	68%
Chibombo	95%	Zambezi	50%

District specific measles 2012

District	MCV1 %	District	MCV1 %
Mkushi	40%	Livingstone	82%
Kaputa	46%	Nyimba	82%
Mazabuka	55%	Lundazi	83%
Luangwa	60%	Mwense	83%
Sinazongwe	61%	Mwinilunga	84%
Isoka	63%	Kaoma	86%

Sesheke	63%	Masaiti	86%
Lusaka	64%	Kasempa	87%
Kafue	65%	Mansa	88%
Kabwe	65%	Mungwi	88%
Shang'ombo	67%	Chama	89%
Kitwe	69%	Nchelenge	89%
Lukulu	71%	Chingola	90%
Luwingu	72%	Luanshya	90%
Kawambwa	73%	Zambezi	91%
Chililabombwe	73%	Monze	93%
Chiengi	74%	Lufwanyama	93%
Mambwe	75%	Kabompo	96%
Mufumbwe	75%	Namwala	97%
Itezhi-tezhi	76%	Mpulungu	99%
Kalabo	77%	Choma	104%
Kalulushi	78%	Kasama	104%
Senanga	78%	Petauke	104%
Siavonga	78%	Mumbwa	105%
Ndola	78%	Serenje	107%
Chipata	79%	Mpongwe	107%
Kalomo	79%	Chibombo	108%
Katete	79%	Kapiri-Mposhi	108%
Mbala	80%	Chilubi	110%
Mufulira	80%	Gwembe	112%
Mongu	81%	Samfya	113%
Milenge	81%	Chadiza	114%
Nakonde	81%	Chavuma	118%
Kazungula	82%	Chinsali	123%

Annexure 6

Average performance for three years 2010-2012

District	DTP3 %	District	MCV1 %
Sinazongwe	50%	Kaputa	47%
Mazabuka	52%	Sinazongwe	49%
Livingstone	53%	Isoka	56%
Mufulira	57%	Mazabuka	56%
Kitwe	61%	Kitwe	57%
Kaputa	63%	Luangwa	58%
Ndola	64%	Kafue	58%
Sesheke	65%	Lusaka	59%
Chililabombwe	65%	Sesheke	60%
Lusaka	66%	Kawambwa	62%
Kalomo	67%	Siavonga	63%
Luanshya	67%	Chiengi	63%
Zambezi	67%	Chililabombwe	63%
Luangwa	69%	Lukulu	63%
Chiengi	69%	Shang'ombo	64%
Chingola	70%	Luwingu	65%
Kawambwa	70%	Livingstone	65%
Mkushi	71%	Ndola	66%
Shang'ombo	71%	Mambwe	66%
Lundazi	71%	Milenge	67%
Monze	72%	Mufulira	67%
Kafue	72%	Kabwe	68%
Namwala	72%	Kalulushi	68%
Lukulu	73%	Chipata	69%
Isoka	73%	Itezhi-tezhi	70%
Mpika	73%	Kazungula	72%

Katete	74%	Chingola	73%
Chipata	74%	Katete	73%
Kabwe	75%	Mufumbwe	73%
Chongwe	75%	Mkushi	73%
Masaiti	76%	Namwala	73%
Samfya	76%	Mongu	73%
Mwinilunga	76%	Kalomo	74%
Mongu	77%	Masaiti	74%
Kazungula	77%	Luanshya	74%
Kalulushi	77%	Lundazi	74%
Mambwe	78%	Mansa	75%
Nyimba	78%	Chama	75%
Milenge	78%	Nyimba	75%
Chama	79%	Mwense	76%
Chavuma	79%	Mbala	76%
Siavonga	79%	Kalabo	77%
Kabompo	80%	Nchelenge	77%
Mansa	80%	Senanga	77%
Nchelenge	80%	Zambezi	77%
Kaoma	80%	Nakonde	79%
Mbala	81%	Monze	79%
Mufumbwe	82%	Kaoma	80%
Senanga	82%	Kabompo	82%
Luwingu	83%	Mwinilunga	83%
Kasama	84%	Choma	84%
Itezhi-tezhi	85%	Mungwi	84%
Kalabo	86%	Lufwanyama	85%
Mpulungu	86%	Kasempa	85%
Mwense	86%	Petauke	88%

Petauke	87%	Mpulungu	88%
Choma	87%	Samfya	92%
Chadiza	87%	Kasama	92%
Mungwi	89%	Chadiza	93%
Lufwanyama	89%	Mpongwe	94%
Mporokoso	90%	Chilubi	94%
Kasempa	90%	Gwembe	96%
Gwembe	92%	Chavuma	99%
Chilubi	92%	Kapiri-Mposhi	100%
Chinsali	94%	Mumbwa	101%
Solwezi	99%	Serenje	101%
Kapiri-Mposhi	101%	Chongwe	102%
Mumbwa	102%	Chibombo	105%
Chibombo	103%	Chinsali	108%
Nakonde	103%	Solwezi	116%
Mpongwe	106%	Mpika	122%
Serenje	109%	Mporokoso	140%

Annexure 7

Survey data (Children 12-23 months) 2011		**Administrative data (Children 0-11 months) 2010**	
Vaccines/doses	Crude card plus history Weighted %	Vaccines/doses	coverage %
BCG	98.3	BCG	94
OPV1	97.9	OPV1	86
OPV 2	95.0	OPV 2	81
OPV 3	90.2	OPV 3	76
DPT-HepB-Hib 1	98.2	DPT-HepB-Hib 1	86
DPT-HepB-Hib 2	95.9	DPT-HepB-Hib 2	83
DPT-HepB-Hib 3	92.5	DPT-HepB-Hib 3	79
Measles	90.3	Measles	91

In the table above, the comparisons of national coverage rates by administrative data and population-based survey shows the administrative data underestimating real coverage. The differences in coverage between officially reported and crude assessments from the survey are < 10-15% less in the former. But an important avenue for further analysis would be to explore the differences between crude and valid coverage from the service providers' registries and HMIS sources. Such exploration could provide clues as to how information collected from service providers can be used to assess valid coverage routinely for program monitoring.